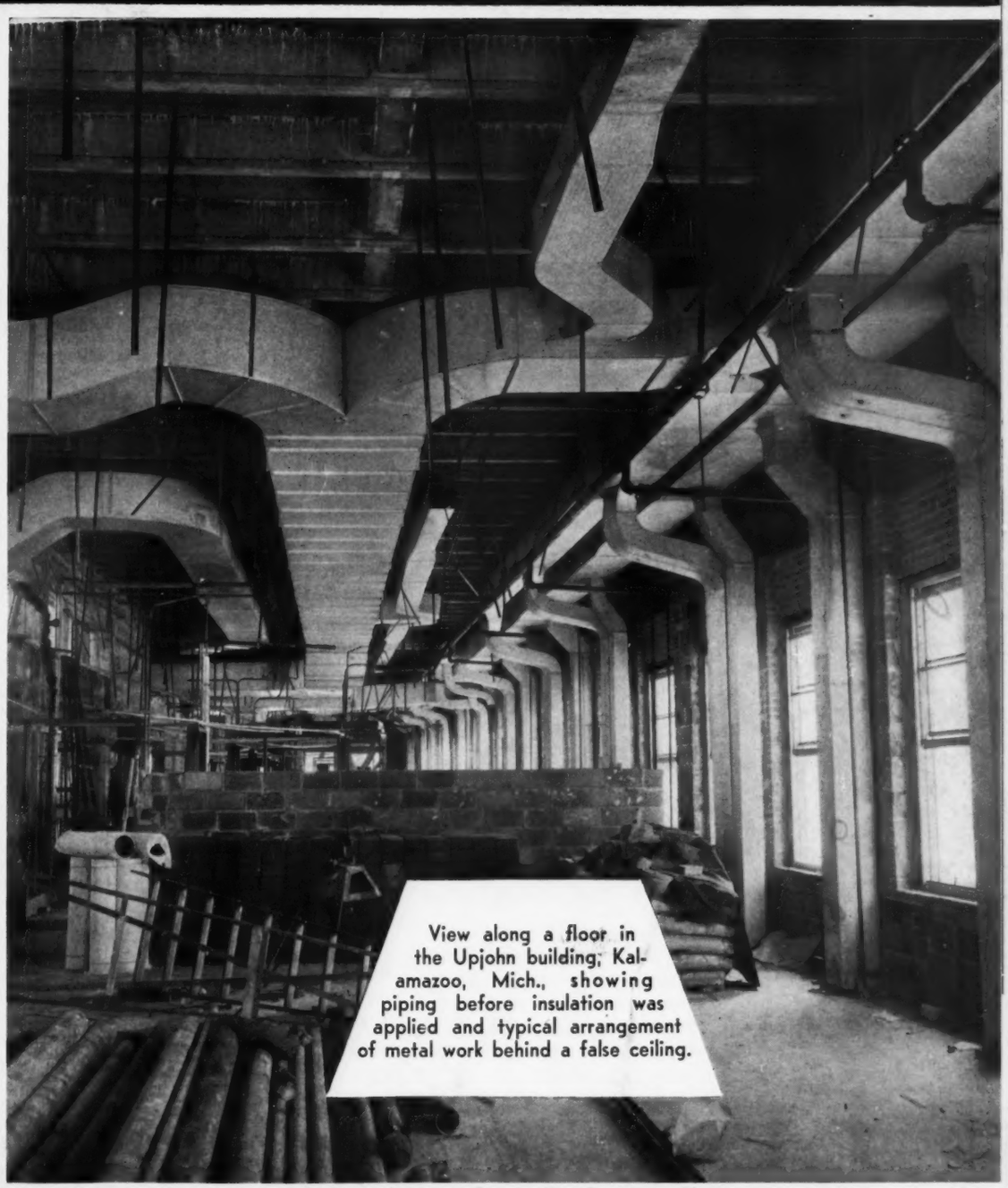
AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING

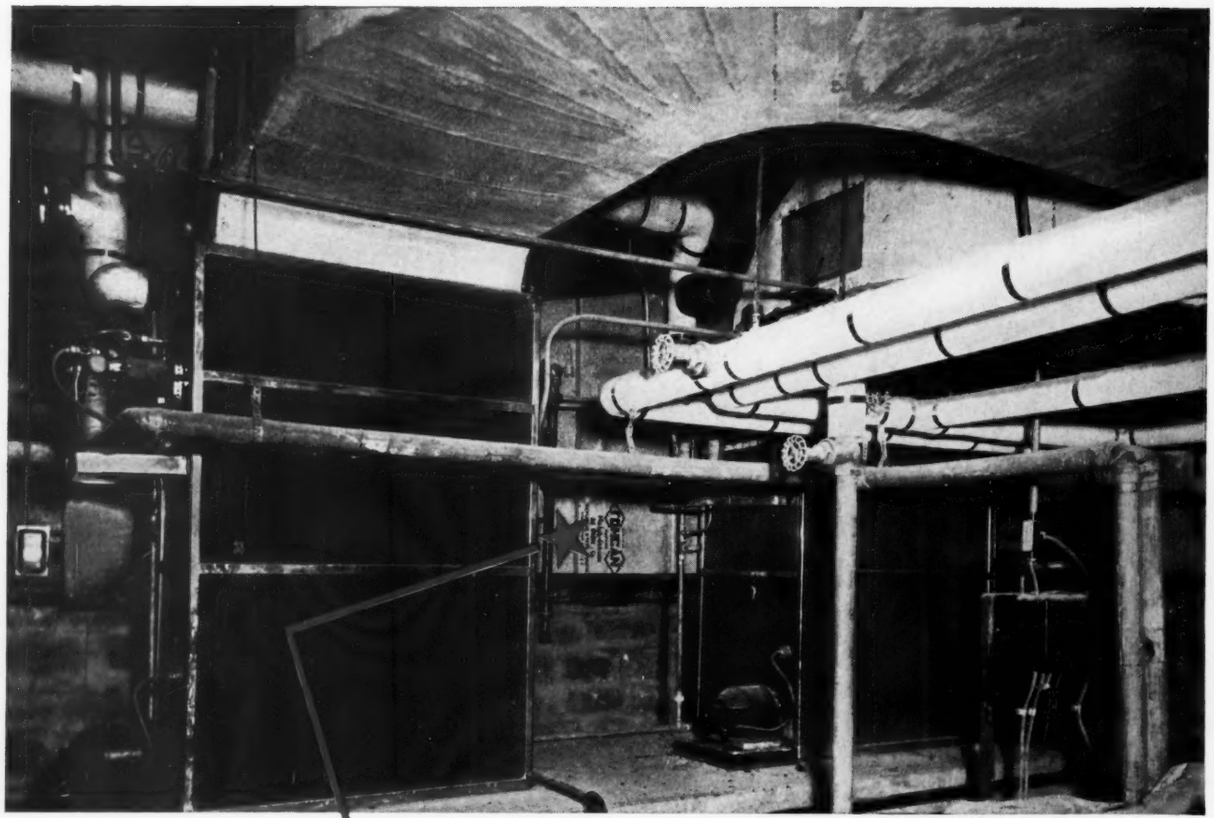


View along a floor in the Upjohn building, Kalamazoo, Mich., showing piping before insulation was applied and typical arrangement of metal work behind a false ceiling.

TABLISHED
8 8 0

MARCH
1936

THE AIR CONDITIONING SECTION



the mark

THAT INSURES DURABILITY IN DUCTS

Next week you may be called on to install an air conditioning system in a million dollar home, similar to that shown in the illustration. Or it may be just another warm air furnace job in a modest cottage. In either event, you can't afford to use anything but a most dependable metal for the ducts.

There's a whispering campaign going on all the time—"Mr. So-and-So does fine work," or "Mr. So-and-So's jobs don't stand up." What "they" say depends on the kind of sheet metal you use.

Thousands of sheet metal contractors realize that this influences their future business and use only Toncan Copper Molybdenum Iron for *all* their work—ducts, furnace jackets, gutters, spouts, flashing, marquees and the innumerable jobs that filter into their shops every year. Toncan Iron lasts longer, and therefore builds good-will. It costs a little more, sells for more and costs less to fabricate because of its better ductility.

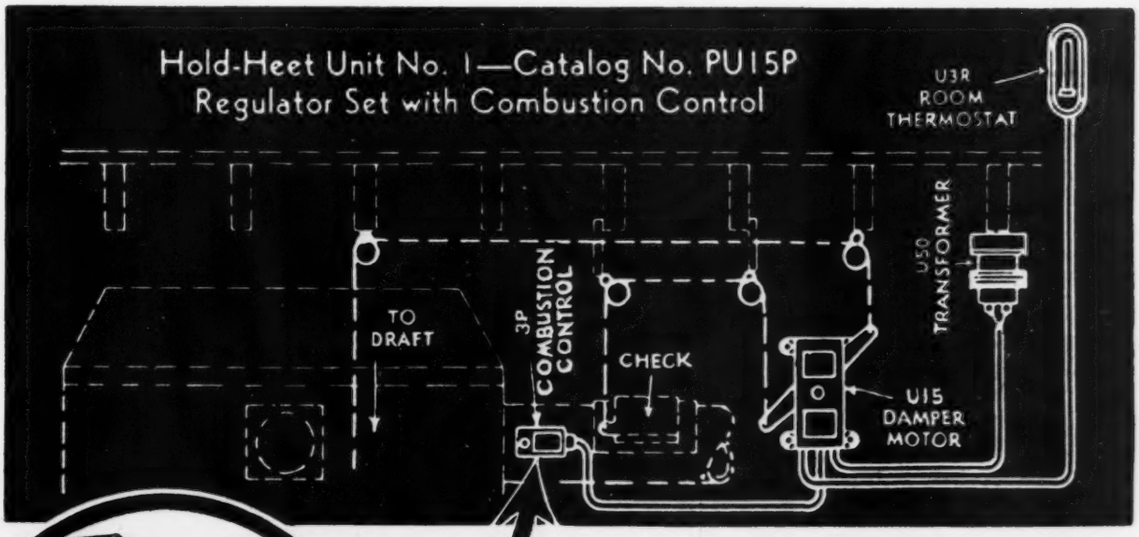
What you can do with Toncan Iron is interestingly told in "The Path to Permanence." Copy sent on request.

Republic Steel
CORPORATION
GENERAL OFFICES · · · CLEVELAND, OHIO

When writing Republic Steel Corporation for further information, please address Department AA.

"NO MORE LIMIT CONTROLS FOR MINE . ."

"Rush two of those Combustion Controls that go in the smoke pipe—I have learned my lesson—I had two furnaces practically ruined by overheating in that last cold spell — No more warm air limit controls for mine — You were right, Russell." ***(An Indiana dealer)***



The exclusive

Hold-Heet Combustion Control with patented rod and the tube mechanism built to outlast the heating plant. **$7.75**

Catalog No. 3P—List price .....

Install in stack between check door and heating plant. Works with any make of electric regulator set.

INSURE LIFE OF NEW GRATES AND FIRE POTS. Every time you install a new firepot or new grates—sell a Hold-Heet Combustion Control as low cost insurance to protect the investment.

EVERY COAL BURNING FURNACE requires a regulator set and a Combustion Control to be modern.

NOTE . . . The Hold-Heet Combustion Control is an integral part of the Hold-Heet Regulator Set.

SUBZERO WAVES prove the "ACID TEST" - - - for - - -

1. ***With a Hold-Heet Combustion Control in the stack,*** **you can work the heating plant right up to its limit of capacity—can get the utmost heat delivery—with safety and with full protection to grates and firepots.**

2. ***With a Hold-Heet Combustion Control in the stack,*** **you can pay for the equipment in short order in direct fuel savings. Excessive stack temperatures mean "coal dollars" flying up the chimney.**

3. ***With a Hold-Heet Combustion Control in the stack,*** **you can prevent wasteful over-runs and unhealthful overheating. The control responds instantly to combustion conditions—keeps the fire always under control—it never runs wild and therefore is quickly checked when the draft is closed.**

WARM AIR LIMIT CONTROLS ARE OBSOLETE. Here's why furnace manufacturers and dealers who "know their stuff" always install a Hold-Heet Combustion Control with every regulator set—the Combustion Control responds INSTANTLY to combustion conditions. The instant you have a hot fire, you have a hot stack. The warm air limit control DOES NOT RESPOND until you change the temperature of all the castings in the furnace. If you would hang 1,000 pounds of cast iron on the responsive tube of the Hold-Heet Combustion Control—you would still have the same rate of response you now obtain with a warm air limit control in the bonnet.

59 of the 76 furnace manufacturers adopted Hold-Heet Combustion Controls the year they were introduced. Some of these manufacturers guarantee grates and firepots against burnout for 20 years when so equipped—now you know why.

Hold-Heet Regulator

Complete with Combustion Control, Room Thermostat, Damper Motor, Transformer and Accessories. Sells at installed price of **$36**

Catalog No. PU15P

It carries a splendid discount to the dealer. It is the finest and most powerful equipment on the market. Install one of these complete units on every new installation. Install a Combustion Control on every existing damper motor installation and insure your customers the same heating and plant protection and fuel economies that are now enjoyed by tens of thousands of satisfied users. Write today for full information.

Exclusive Distributors for East, Southeast and Export
MELCHIOR, ARMSTRONG, DESSAU CO., 300 Fourth Ave., New York
Boston, Brooklyn, Rochester, Philadlephia, Harrisburg, Baltimore

Exclusive Western Distributors
MONTGOMERY BROTHERS, 61 Fremont St., San Francisco
Los Angeles, Seattle, Portland

Exclusive Northwestern Distributors
KELLY-HOWE-THOMPSON CO., 309 South 5th Ave., West Duluth, St. Paul, Billings

RUSSELL ELECTRIC CO., *Mfrs.*, 342 W. Huron St., CHICAGO

In This Issue

The remodeling of old school buildings so that the heating and ventilating system is in keeping with modern ideas seems likely to be a major activity during the next three years. The details of an interesting job are related on page 10.

*

Not long ago a reader asked us how to collect bean dust. We had not heard of this product so we asked J. W. Baybutt (see page 14) to tell us the answer.

*

Whether your complaining customer remains a customer depends on how you treat your "comebacks." One of our readers explains his system which he claims works in an excellent manner. (Page 13.)

*

We publish on page 16 the first of what we hope will be a series of articles on welding as used in the sheet metal shop. The author has used welding since its infancy.

*

One of the most interesting duct jobs of recent months is the job explained on page 18.

*

This month's issue completes the Minneapolis code excepting those portions relating to oil burners, gas burners, stokers. We will gladly print these sections if you wish them. Page 22.

*

G. A. Voorhees continues his series on remodeling gravity systems to forced air on page 29. This article explains the possible register air temperatures and velocities.

*

O. J. Kuenhold completes his articles on humidification with part 3 on page 32. If you have enjoyed these articles and want some specific questions answered write us at once.

*

The University of Arkansas conducted tests to find the best method for controlling air and gas in conversion burners installed in furnaces. You can read about their tests and their recommendations on page 34.

*

S. Konzo continues his series on page 36. This article discusses the resistance of registers —especially the resistance of the new directional flow types.

*

Every so often someone writes in to ask for the basic formula for figuring heat loss coefficients for certain types of walls. Very frequently we wonder if the explanation we give is thoroughly understood. Not long ago Professor Kratz of the University of Illinois delivered a talk on this subject so clear that we feel readers will like to study it. See page 45.

AMERICAN ARTISAN

With which is merged

FURNACES and SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating

Sheet Metal Contracting — Ventilating

Air Conditioning

J. D. Wilder, Editor

Vol. 105 No. 3 — March, 1936 — Founded 1880

CONTENTS

Ordinances, Spring Business, Brain Bound 9

Ventilation Modernizing in a Milwaukee School 10

Comebacks—A Method for Placing Responsibility 13

Methods for Bean Dust Removal 14

Welding Procedure for the Sheet Metal Shop 16

Hanging and Insulating Duct Work on a Large Job 18

Shearing Precautions for Bright Metal 20

The 1936 Michigan Convention 21

Minneapolis Heating, Ventilating Code 22

A Heating System for a Small Factory 63

The Problem Corner 65

New Products 68

News Items 72

New Literature 80

THE AIR CONDITIONING SECTION

Remodeling Gravity Systems for Forced Air 29

Some Basic Principles of Humidification 32

Control Methods for Conversion Burners 34

Konzo on Resistance of Registers 36

Frost and Condensation on Windows 41

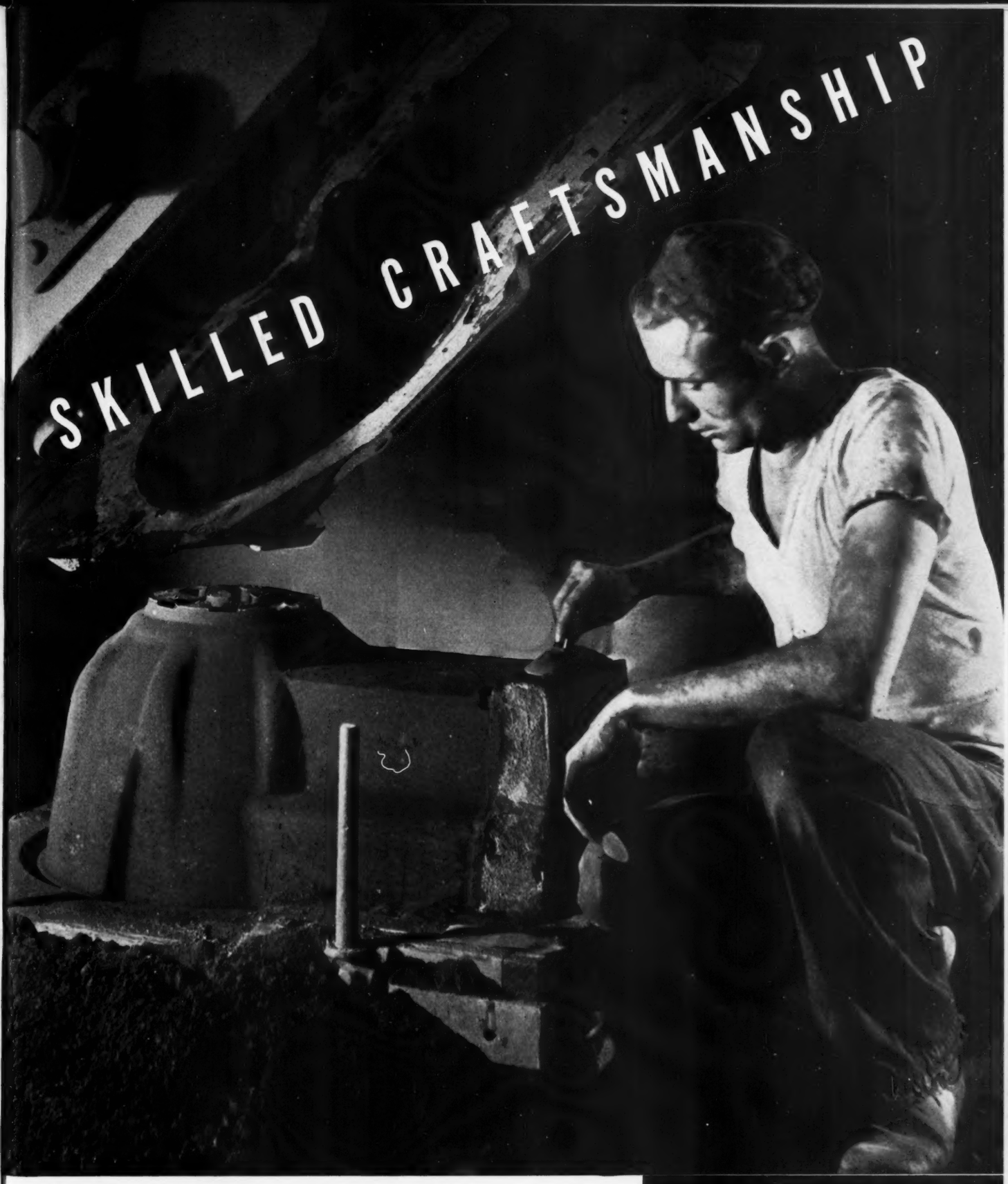
Heat Loss Calculations for Space Heating 45

Member of Audit Bureau of Circulations—Member Associated Business Papers, Inc.

Published monthly by Keeney Publishing Company, 6 North Michigan Ave., Chicago. Branch Offices—In New York, Room 1950, Grand Central Terminal Building, Murray Hill 2-8293; In Cleveland, 2047 Rossmoor Road, Cleveland Heights, Yellowstone 1540; In Los Angeles, J. H. Tinkham, 1406 S. Grand Ave., Richmond 6191. Copyright 1936 by Keeney Publishing Company—F. P. Keeney, President; W. J. Osborn, Vice President; R. Payne Wettstein, Secretary; Chas. E. Price, Treasurer. Advertising staff: Wallace J. Osborn, R. Payne Wettstein, Robert A. Jack, J. H. Tinkham.

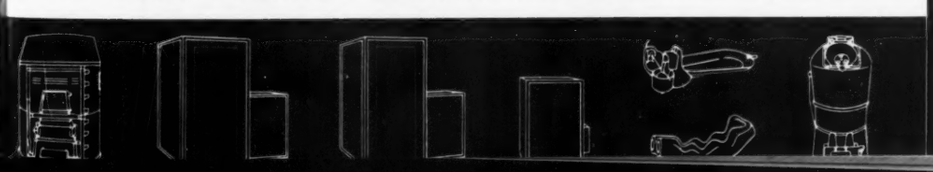
Yearly Subscription Price—U. S. and possessions, Canada, Mexico, South America, Central America, $2.00; Foreign, $4.00. Single copies, U. S. and possessions, $.25. Back numbers, $.50. January, 1936, Directory issue, $1.00 per copy. Entered as second-class matter, July 29, 1932, at the Post Office at Chicago, Illinois, under the act of March 3, 1879.

More than 7,000 Copies of this Issue are being distributed



SKILLED CRAFTSMANSHIP is more than a pretty phrase when applied to Rudy products. Built by men who have devoted their lives to furnace construction, Rudy furnaces express in action the father-to-son tradition of quality. In assuring satisfied users they are the firm foundation upon which a dealer can build a profitable business.

THE RUDY FURNACE COMPANY...DOWAGIAC, MICHIGAN



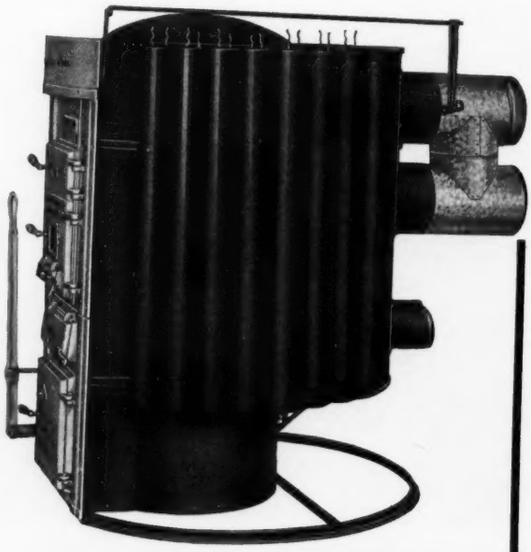
RUDY
PRODUCTS

ALWAYS MENTIONED WHEN BETTER HEATING IS DISCUSSED

PEERLESS HOME HEATING EQUIPMENT..

The season for the installation of modern home heating and winter air conditioning equipment is now just getting under way. Prepare yourself for this tremendous volume of business. Be sure that the equipment that you offer your clients is the best value for their money . . . that it is engineered, correctly . . . made perfectly . . . and will give years of trouble-free service. Also assure yourself that the line you are handling possesses superior features that can be easily understood by your customers . . . that are distinctive, exclusive and mean economy and ease of operation. If a line of heating equipment has all these points it will sell on superiority of merit and result in satisfied customers.

Peerless home heating equipment is most complete . . . furnaces of all types, Cleanaire, blowers, complete air conditioning units, grills, faces and fittings. In fact, everything to complete a perfect heating or air conditioning job is manufactured by Peerless. Made under one roof from only fine materials and by skilled workmen. They have all the most modern features (many that cannot be found in any similar equipment) that will arouse customer interest and create the desire to possess. Investigate the great Peerless line. We are certain its superiority will convince you that it is the one you should handle.



THE PEERLESS BOILER PLATE FURNACE WITH PRESSURE HEAT TUBES

Fourteen heat compression tubes force heat to every room in the house at a speed 50% greater than that of ordinary furnaces.. No booster or fan necessary. A great fuel economizer and a most efficient furnace equiped yith automatic damper control . . . and priced to sell!

PEERLESS FOUNDRY COMPANY

1853 LUDLOW AVE.
INDIANAPOLIS, IND.

TWO STEPS *in selling that* LEAD *to* JOBS *like these*

Be sure you take them both when you call on Chemical and Process Plants

THERE are two steps that lead to every Monel Metal job . . . and your biggest success comes when you take them both.

Your customer is interested in his own work and the way his present Monel Metal equipment helps him get it done. But you can often open his eyes to other uses for Monel Metal around his plant. Suggest them to him.

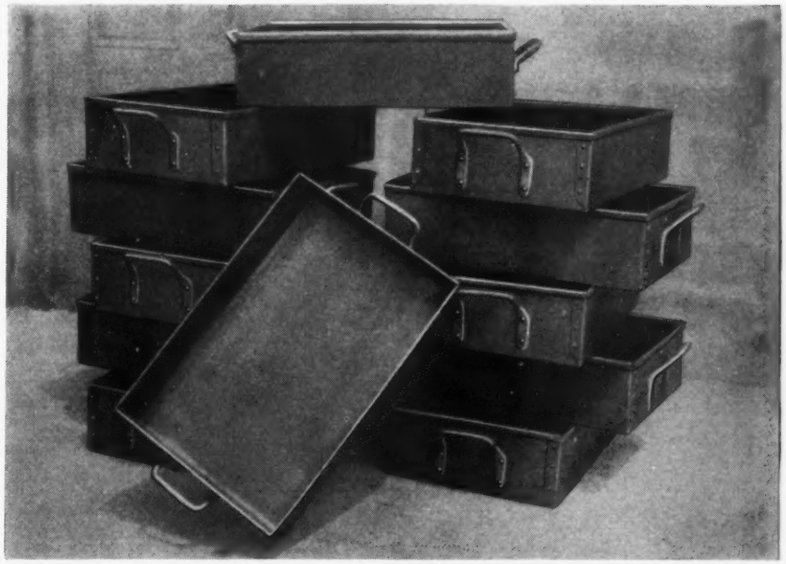
He is interested in making a connection with a contractor who can do a bang-up job of fabricating. Prove that you can turn out anything he wants, in a workmanlike manner.

Always remind any prospect you call on that Monel Metal is rust-proof, resistant to corrosion, and tough, strong and durable. For those reasons Monel Metal is widely used in chemical and processing plants for drying trays, trucks, containers, hoppers, chutes, table tops, utensils, ventilating hoods, fume ducts, measures, percolators, steam baths, oven linings, and sinks.

Write for working instructions and any other information you might need for going after this class of work. We will gladly help you.

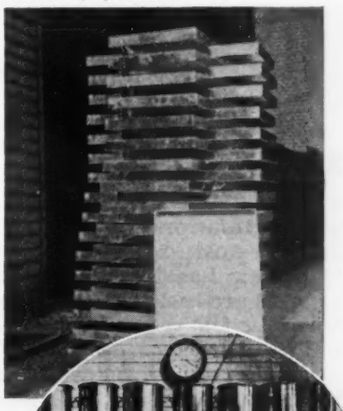
• • •

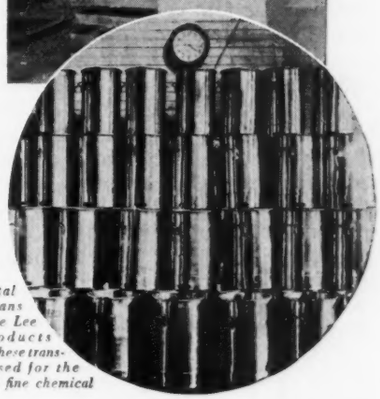
THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.



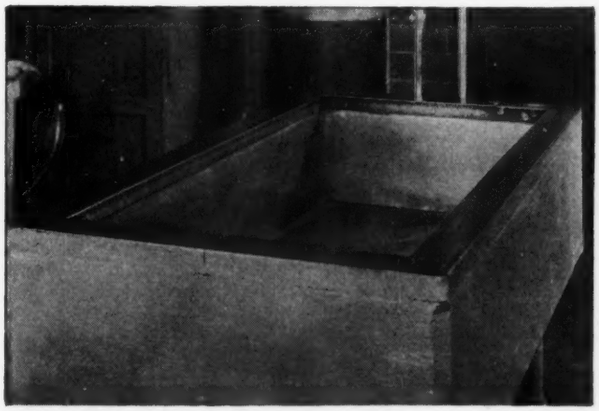
Heavy gauge Monel Metal pans used in chemical plants where resistance to corrosion and ability to withstand rough usage are of utmost importance. Joints made by riveting, using Monel Metal rivets. Built by Metal Products Corporation, Weehawken, New Jersey.

Monel Metal trays made by the Metal Products Corporation, Weehawken, New Jersey, for the handling of dye-stuffs. Made of 20 gauge Monel Metal sheet, soft soldered.

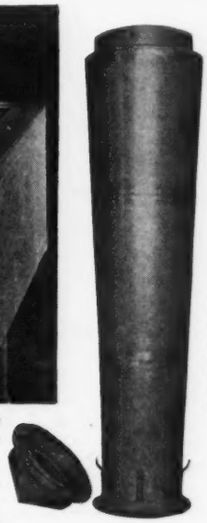




Monel Metal transfer cans made by the Lee Metal Products Company. These transfer cans used for the handling of fine chemical products.



Concrete sink lined with Monel Metal sheet, lock seam silver soldered. This is one of a number of similar Monel Metal lined sinks used throughout a well-known pharmaceutical plant.



(At right) 16 gauge Monel Metal Percolator used by The Upjohn Company for the extraction of drugs from herbs. The percolator is 26" diameter by 95" high, gas welded throughout. Built by the Kalamazoo (Mich.) Sheet Metal Mfg. Co.

MONEL METAL

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

• LINE UP WITH • MUELLER FOR 1936

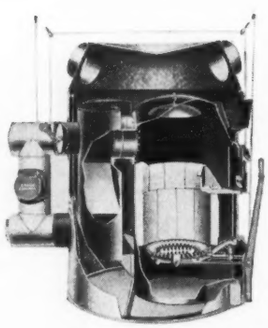
MUELLER FULL FRONT FURNACE

The "Full Front" furnace is dependable and economical. It has achieved a position of leadership in warm air heating, and many thousands are installed in homes throughout the country. Radiators are one-piece, streamline construction with integral smoke and cleanout openings extending through the casing and shield. Feed sections and firepots are heavily ribbed. Feed and ashpit sections extend through fronts, with slip-over shield, simplifying erection and eliminating bolted construction. Six sizes—single and double door.

Get your share of the new building and modernization money to be spent in 1936. This will be a record year.

New opportunities abound for you with Mueller's wonderful new products, as well as the standard Mueller Coal-Fired Furnaces. Be sure you get all the facts on Mueller's products before you decide on any heating equipment. From your jobber—or write us direct.

Mueller's new sales helps, advertising and cooperation will help you get a good share of the modernization money to be expended. Be sure you are lined up with the right line and right company. Write Mueller-Milwaukee today.



MUELLER COAL AND OIL FURNACE

The All-Steel riveted and welded furnace is equally suited to coal or oil. Side wings forming feed pouch are extensions of heater body. Riveted joints being further sealed by a heavy fillet weld make practically a one - piece body. Seven sizes, 20 to 34 inch drums, including Giant radiator type. A quick, powerful heater.

MUELLER • MILWAUKEE

L. J. MUELLER FURNACE COMPANY, MILWAUKEE, WIS.

AMERICAN ARTISAN

Volume 105 Number 3

Installation Ordinances

More and more there seems to be coming into industry favor the idea that codes or ordinances which specify just how heating and air conditioning installations shall be made are a feasible and satisfactory method for eliminating many of the hangers-on and ignorant firms which make fair competition impossible.

In fairness it should be stated that this thought is not new—ordinances have been in effect in many towns for several years. A feeling which is new, however, is that such ordinances should definitely specify how the installation should be engineered and apparatus selected and placed so that the buyer may have some measure of protection.

With this growing interest in codes may we point out that as long ago as 1931 we declared that if ordinances protect such trades as plumbing and electrical work, warm air heating should likewise be protected. And that if the public gets a better, safer installation under a code, then we should offer similar protection.

We pointed out in 1931 that codes in themselves are lifeless things and that every code (no matter how thoroughly devised) is only as useful as its application. No code is any stronger than its enforcement.

We say, therefore, that those organizations working for ordinances should keep these thoughts in mind. How much money can such an ordinance count upon for enforcement? If there is not enough money, any code is useless. What percentage of all installers are favorable to a code or can be sold on its advantages? The greater the objection the harder it will be to enforce the law and the more widespread will be the violations. No code is good if it bcomes a political football. Means should be devised, therefore, to insure industry representation on any examining board, licensing board or committee to enforce. Further, industry representation should be changed periodically—as should be the political members or appointees.

Engineering supervision, inspection, fees, and so forth are all important. Get as much of each as possible and leave to future acceptance such increases as may be necessary. We believe that codes will sell themselves if they are clearly drawn and politically clean.

Spring Business

As this issue goes into the mails signs of spring will be evident in most communities. It has been a long, cold winter—in most areas one of the coldest and longest on record. Actually thousands of furnaces which might have survived an ordinary winter have been rendered unsafe for another heating season. Owners who can afford new systems will undoubtedly be in the market in numbers to make our hearts glad.

While many of them will not wish to spend more money than necessary, they will at least be prospects for the better types of heating we have been perfecting. It is not unreasonable to believe that most of these owners can be sold the newer types of furnaces, automatic firing, mechanical circulation, cleaning, control, humidification, rectangular ducts, better appearance. Only an actual inability to find the money should keep owners from buying this greater comfort.

Our competition will be three fold. First, will be contractors of equal standing who will want to sell much the same system we recommend. Second, will be the specialty machines which large corporations have introduced in the past three years. Last, will be the cut-priced operator who will try to sell as little as possible, as skimpily as possible, just to get a job.

Surely we have all had plenty of experience with these three competitors! If we have not yet found ways and means of making our story stand up to theirs, something is wrong with the millions of words spoken and written, at conventions, by trade papers, by manufacturers and their salesmen, who have labored so long and attentively to propagate our fund of information.

Brain Bound

Not muscle bound! Brain bound. The meaning is the same, but the results are as far apart as the poles. Brain bound brings to mind a story told a few days ago of a contractor who in his years in business and before that his father and before that the grandfather had been sheet metal contractors. Metal roofs, metal ornamentation, blow piping, metal equipment had been the firm's bread and butter for three generations.

Then business in this line began to slide away. Its pace grew faster and faster until within a few months what had once been a thriving business wasted to a shadow. Had the owner been brain bound he probably would have passed out of the picture enveloped in a guest of wailing and lamentation, but his mind refused to be bound by tradition or fear.

He looked around for "something different to do." He found heating on the increase, but this information was as limited as his clientele. He had to built information and clientele simultaneously or go to the wall. He adopted furnace cleaning—surely nothing new, nothing startling, something no other man could do—but cleaning gave him an opportunity to build good will; a following; customers, and learn something of what is needed in heating work. Today this contractor is making money—not because he adopted cleaning, but because he refused to be brain bound.

Modernizing Details of a Milwaukee School Ventilation System

During the last few years failure to pay taxes compelled school boards to curtail expenses, cancel all new construction and carry on little or no remodeling of existing buildings. In many instances this "do nothing" program resulted in actual danger because of poor ventilation, heating and sanitary conditions. Now that money is coming in and Federal money has been made available it would seem as though large sums will be spent for repair and remodeling to make old heating and systems conform with revised standards. In Wisconsin a new heating and ventilating code has been drawn up and will go into effect shortly.

By G. R. Stearns

IN Milwaukee, as in other sections of Wisconsin, the remodeling of old school buildings in order to make the heating, ventilating and sanitary systems conform with revised standards of comfort and health is getting under way rapidly. During last summer's vacation period work was started on several old buildings and in the next few years it is intended that all buildings will be remodeled as required to meet revised specifications.

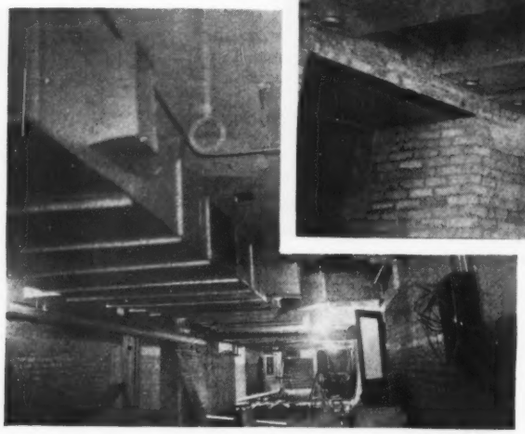
An interesting project of this type was completed last summer by the Milwaukee firm of Reinke and Schomann, Inc., in the Clark Street Elementary School. This building is fairly old and was built and equipped before present standards were adopted. The building is three stories high with a basement containing certain shops and study rooms and an attic used entirely for the ventilation system. Beginning at the end of the spring term structural changes were placed under contract, equipment was moved for greater efficiency and the heating system was changed from a direct heated layout to a combination heating and ventilating system.

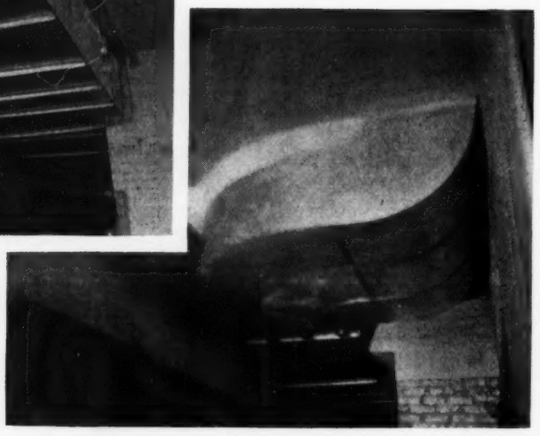
The entire job was laid out by the Milwaukee school board engineer in collaboration with the architectural department of the local school system. Practically new designs were adopted for the new ventilating installation. The new drawings were taken by Reinke and Schomann and from them measurements for the metal work were taken off later to be verified in the building. In this way all duct section measurements were checked by actual measurement to see that all work would fit when erection began. This system worked exceedingly well, according to Mr. Schomann, the double check of the measurements eliminating unnecessary delays at the time of actual installation.

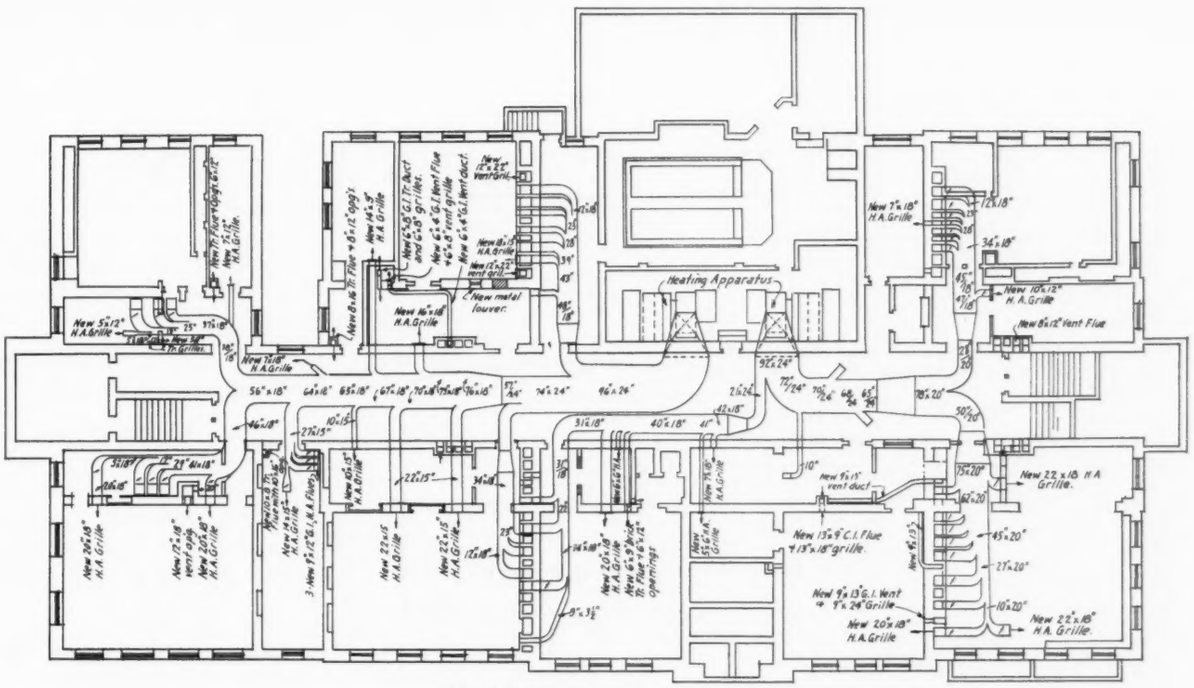
The erecting crew consisted of two men, for the most part, while a third man from the shop took all of the measurements on the job. Two and sometimes three men worked on the fabricating in the shop, but they did not give their full time to this one job. Approximately three months were required for completion of the project, the work being done during the school vacation period in the summer.

Below—Looking down a basement corridor showing a main supply duct.

Left and below—Close-up views of some of the fittings used in the basement.






Heating Apparatus
New metal louver
New 46"x18" H.A. Grille
New 12"x22" vent grill
New 7"x18" H.A. Grille
New 10"x12" H.A. Grille
New 8"x12" Vent Flue
New 22"x18" H.A. Grille
New 9"x15" vent duct
New 13"x9" G.I. Flue to 13"x18" grille
New 9"x13" G.I. Vent to 9"x24" Grille
New 20"x18" H.A. Grille
New 22"x18" H.A. Grille

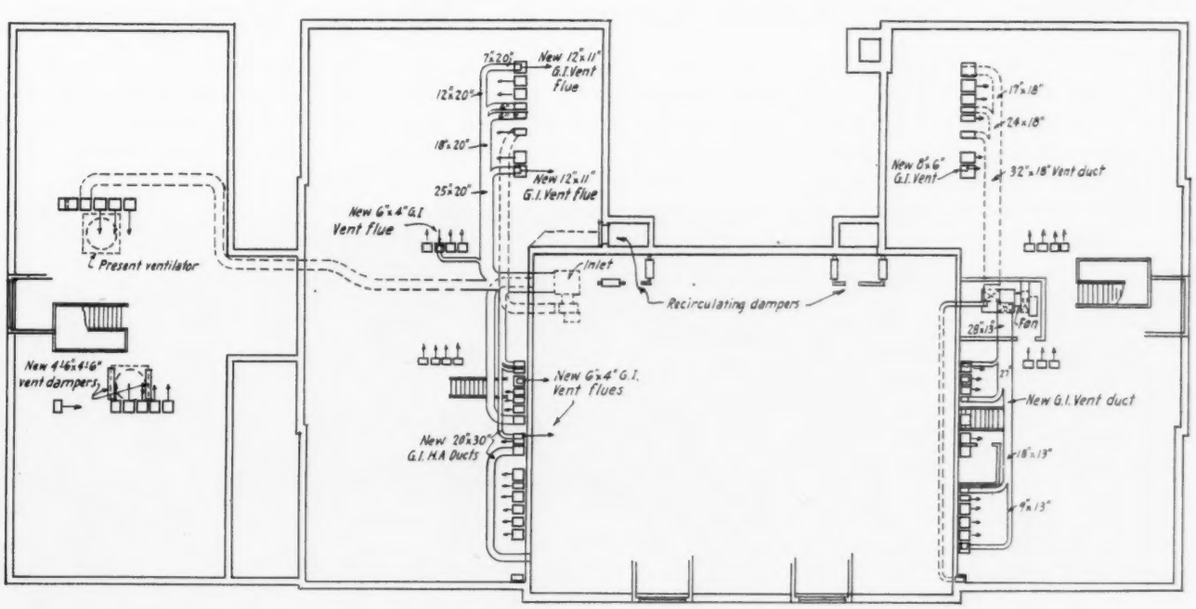
BASEMENT PLAN

The basement plan shows the main supply ducts and the numerous branches which connect to the brick flues. While the metal work is all new the flues were already in place.

While the building is heated by means of a steam system, the new specifications call for tempered air supplied to the various rooms through the newly installed ventilating system. Two blast heaters were installed to temper the air, pan humidifiers being placed in front of each of the blast heaters.

There are two supply fans in the basement—one for each main supply system. Each of these fans serves approximately one-half of the building.

All of the metal work was fabricated in the Reinke & Schomann shop because of the better working conditions existing there. As a matter of fact, Mr. Schomann says, his company makes a practice of fabricating all its work in the shop. In the case of the Clark Street School there was no alternative, since there was not sufficient space available to perform any fabricating at the building. In the fabricating procedure, the branch takeoffs were laid out by the man who took the measurements for the duct work and were cut in the proper main



ATTIC PLAN

The vent flues rise to the attic and exhaust into the attic space. A large ventilator removes attic air. The small exhaust fan is for toilets and cloak rooms.

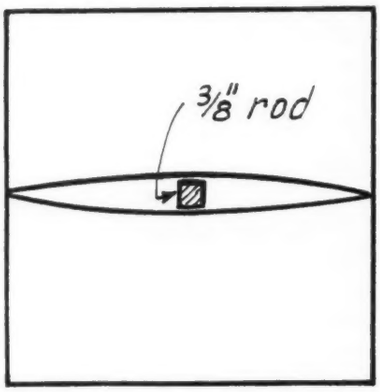
duct sections before assembly and erection.

Three different gauges of metal were used in constructing the duct work, as follows: On ducts up to 12 inches wide, 24-gauge metal was used; on ducts ranging from 12 to 24 inches wide, 22-gauge metal was used; and on ducts more than 24 inches wide, 20-gauge metal was used, braced where necessary.

The existing brick flues in the building presented some difficulty in installing the new ventilating system. These flues had an arched brick deflector lined with a metal pan deflector at the opening so as to deflect the air toward the ceiling. It was necessary to remove the existing arches. In remodeling the system, galvanized iron diffuser heads were substituted at all supply openings. The existing brick flues were used with the galvanized iron diffusers to secure an even distribution of air at the openings.

The brick flues were connected at the bottom to the proper branches through a galvanized iron elbow at the bottom of each flue. A butterfly pattern (2-piece volume) damper was installed in order to eliminate air noise. The damper shaft extends into a damper lock which can be used to regulate the amount of air. The damper is locked and can not be tampered with once the air delivery is balanced.

Elbow locks were used for elbows, curves and offsets. Standing seams and side locks were used on



Butterfly Damper

rectangular sections. The ducts are suspended by ¼-inch by 1-inch wrought iron hangers hung from the wood joist above and connected to 1¼-inch pipe with caps at the ends. The hangers were placed approximately 8 feet apart and were fastened to the sides of the joist by means of lag screws.

The old brick exhaust flues are used for vents, galvanized iron heads being placed in the attic at the top of each flue, keeping the opening at least 1 inch above the floor in order to prevent back-draft. The attic is used as a plenum chamber and the air is automatically regulated so that it can either be exhausted or recirculated.

In assembling the job, the pieces were made up in 6-foot to 8-foot lengths as most convenient for the erection process. Angle slips and drive slips were used for the connections.

Mechanical Equipment

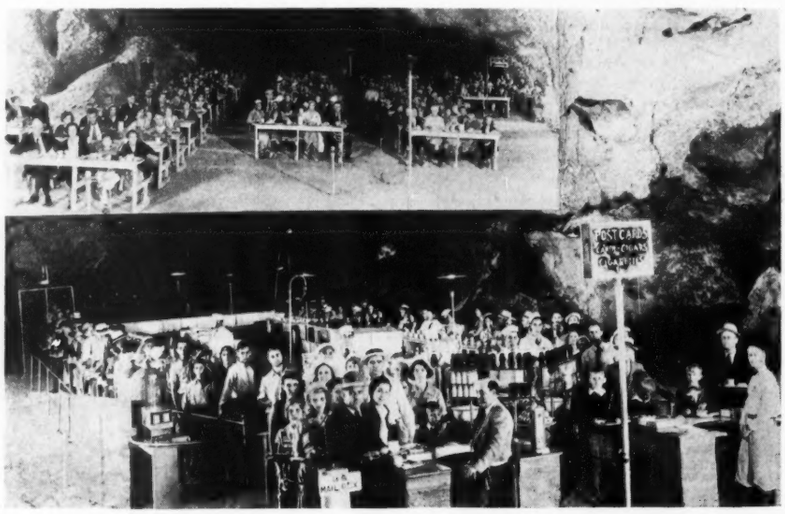
A brief description of the mechanical equipment will be of interest. Two main fans were installed. One of these fans has a capacity of 23,650 c.f.m., a maximum speed of 172 rpm., and requires not to exceed 5.0 B.H.P The other fan has a capacity of 24,000 c.f.m., a maximum speed of 183 r.p.m., and requires not to exceed 5.8 B.H.P.

There are two toilet exhaust fans installed in the attic. One of these is designed to exhaust 3,450 c.f.m. operating at a minimum speed of 510 r.p.m. and requires not to exceed 0.9 B.H.P. The other toilet fan has a capacity of 2,800 c.f.m. operating at a minimum speed of 470 r.p.m. and requires not to exceed 0.7 B.H.P. Each of these fans serves one-half of the building.

Stainless Steel Resists Corrosion 750 Feet Underground

EVERY year, approximately one hundred thousand visitors inspect the magnificent natural beauty and ethereal grandeur of the world famed Carlsbad Caverns in New Mexico. Few of them perhaps, ever stop to realize that while partaking of a noonday luncheon, seven-hundred and fifty feet below the surface of the earth, that they are dining in what is reported to be the world's deepest commercial lunchroom, according to J. Bert Leck, president of the Cavern Supply Company, concessionaire at the Caverns.

"Much experimentation with various types of metals was made before selecting stainless steel as a covering for our equipment in the lunchroom," he states. "Ordinary metals failed to resist the corrosive attacks of this salt and moisture-laden atmosphere. Our six tables, two of which are three feet wide and fifty feet long, as well as our coffee urn are all made of Stainless steel. Unusually high humidity and hard daily usage, fail to mar its finish. Cleansing is remarkably easy and inexpensive, since only ordinary soap and water is all that is required to restore the original lustre."



GICHNER INC.
JOB RECORD SHEET
418 SIXTH STREET, N. W.
WASHINGTON, D. C.
DATE
NAME
ADDRESS
PROMISED
JOB LOCATION
ORDER TAKEN BY
AUTHORIZED BY
DESCRIPTION OF WORK
SUMMARY
MATERIAL
LABOR
OVERHEAD
COST
PROFIT
SELLING PRICE
REQ.
MATERIAL
LABOR CHARGE
WORKMAN
T. C. NO.
HRS.
RATE
AMOUNT
JOB NO.
ASSIGNED TO
COMPLETED

Comebacks—A method for Placing the Responsibility

By Lawrence E. Gichner

Gichner, Inc.
Washington, D. C.

A COMEBACK in the parlance of roofingdom is a job, which didn't last—a job about which a customer complains. It occurs most frequently in the repair branch of the industry—a phase of our business which many shops neglect.

Our organization has worked out a method for handling comebacks which we think is practical and efficient.

A comeback is written up like a regular job. To distinguish it, the job record sheet paper is pink instead of white. All pink records are kept on a separate file. Besides name, address, date, it contains a description of the work, who estimated it, and the mechanic who executed it.

By isolating the pink slips a world of valuable information is obtainable at a glance. First, it checks upon the mechanics. If the amount of comebacks are out of proportion for any single man he is confronted with the facts and admonished to improve.

It has been found that better results are obtained by pointing out definite jobs that had to be done over than just speaking to the individual in general. The usual expression "you've got to buck up and do better," doesn't always impress. As a rule the man takes it casually, thinking "Oh! the Boss says that to all the boys every now and then just to pep them up." But when the Boss has the real data to present there is no room for doubt.

Mechanic or Estimator

Mechanics, when sent out even on their own comebacks, are paid full time. Not to do so would be more costly in the end because knowing they would not be paid, if they made a mistake, they would spend more time than necessary when originally on the job.

The second check is on the estimator showing whether he allowed enough to handle the job thoroughly. If he is figuring too low, he, too, is placed on the carpet.

The third check on work done proves the most valuable in dollars and cents made and saved, for in nearly thirty per cent of the cases it is found to have been a new job and not a comeback.

The customer phoning his complaint usually states "The roof you fixed for me still leaks." It is written as a comeback, but investigation reveals that the radio man punched holes and drove nails for his aerial, leaves clogged up the gutters, a child's ball rolled in the spout, gashes were hacked while shoveling snow and picking ice, or a falling brick from an adjoining chimney caused the trouble. Roofers know a dozen and one other things which happen daily.

More often it is found that the leak is in a porch or section of the structure not at all covered in the original estimate. When confronted with a true statement of facts one should seldom have any trouble with customers refusing to pay.

"The job you did for me last year is still causing trouble," we are told.

(*Continued on page* 82)

Suggested Methods For Dust Removal In Bean Cleaning Plants

The sketches on the facing page show three types of filters practicable for collecting bean dust. The centrifugal separator operates on the familiar cyclone principle. The cloth bag unit may be automatically shaken as shown. The baffled housing causes deposition by reducing velocity and effecting sharp directional changes.

By J. W. Baybutt

Instructor, Rochester Athenaeum and Mechanics Institute

USUALLY bean cleaning plants are located in the open farming sections or at least on the outskirts of small towns where dust can be liberated into the open air without danger to human life. In some towns, however, these plants are gradually being surrounded by residential and business buildings and dust may be a nuisance.

Recently we were called in to design a method of dust removal in a plant in the latter category. The machine was about 4 feet wide and had a fan capacity ot about 7,000 c. f. m. by anemometer measurement. Production certainly must have been at a maximum this past season judging from the clay dust deposit on all the surrounding buildings, but of course it was impossible to estimate the actual volume of dust to be recovered per hour on the basis of the dust scattered around the neighborhood.

Centrifugal Separator

Probably the simplest remedial installation in this case would have been to install a centrifugal separator and collecting bin as shown in Fig. 1, but due to the nearness of residential property we were afraid that the very fine dust carried through the ordinary separator would still provide room for complaint.

The static pressure resistance in this type of collector usually runs above 1 inch of water gauge and as we were unable to obtain the fan operating statistics we feared that such a back pressure might seriously interfere with the bean cleaning operation in that the air volume would be cut down.

Water separation could have been used, but in this case the result would be a pretty messy affair and freeze-up danger might enter in.

Cloth Separator

We decided finally on a cloth type unit as shown in Fig. 2, using a velocity of 20 f. p. m. through the face area of the material. Some states recommend as low as 2 f. p m. velocity particularly on sand blasting operations, but we have never used less than 5 and in some cases up to 40 f. p. m. with fairly good results. It may be well to point out that higher cleaning efficiency and lower power cost will prevail when using the lower velocity but first cost of equipment and space available sometimes determines the minimum velocity possible.

On this particular job the static pressure was only ¼ inch water gauge when starting up, but the resistance built up rapidly to 2 inches in 2 days. This, of course, was too high and interfered with the cleaning operation. Shaking the cloth dropped the resistance below ½-inch and this operation was necessary at least once a day. About a barrel of dust was picked up the first day.

An automatic shaker with motor drive would be desirable for this shaking and such a unit can be made up quickly, particularly now that the reducing machine craze has let up and liberated vibrating mechanisms with ¼ h. p. motors.

Standard pipe shafts with pipe flange bearings and bar stock levers can be used for the shaker linkage as shown in Fig. 3. A few seconds operation of this shaker drops the back pressure on most jobs from 2 inches to less than ½ inch based on the 20 f. p. m. velocity. The fans should be shut down when the shaker is in operation.

Settling Chamber

Some dust removal can be obtained by a method shown in Fig. 4, this scheme sometimes lending itself to space under loading platform. The longer the run the more dust removed, obviously.

It must be remembered that any dust separating equipment must be serviced constantly and the owner should understand that the air filtering will be impaired if the equipment is neglected.

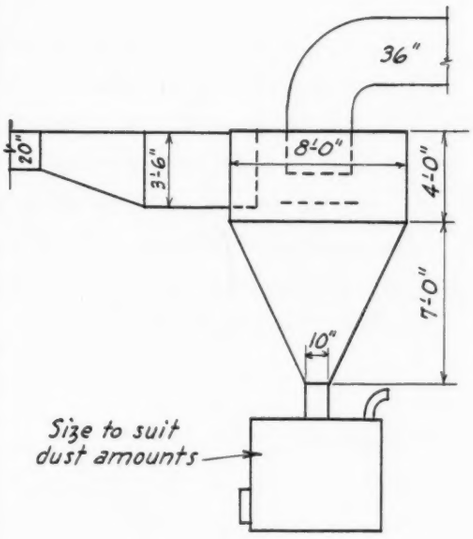


FIG. 1 ELEVATION OF CENTRIFUGAL TYPE SEPARATOR

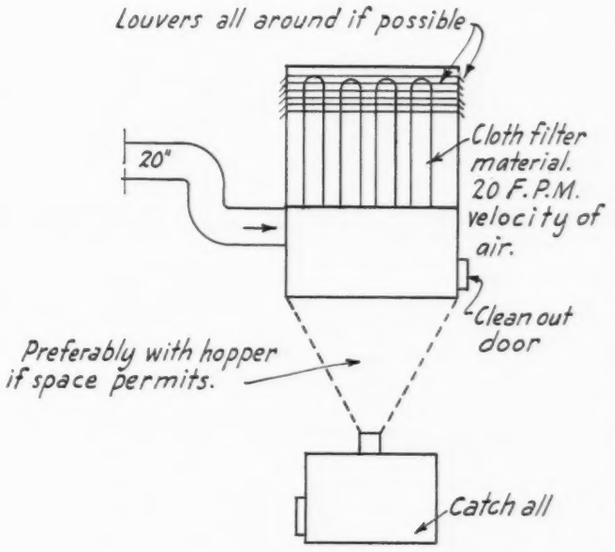
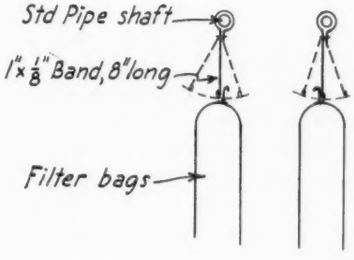

Louvers all around if possible
20"
Cloth filter material. 20 F.P.M. velocity of air.
Clean out door
Preferably with hopper if space permits.
Catch all

FIG. 2 - ELEVATION OF FILTER CHAMBER



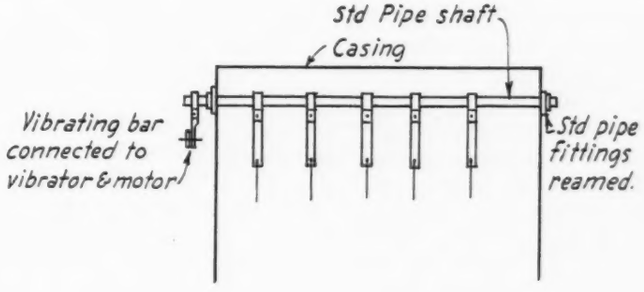


FIG. 3 SHAKER MECHANISM

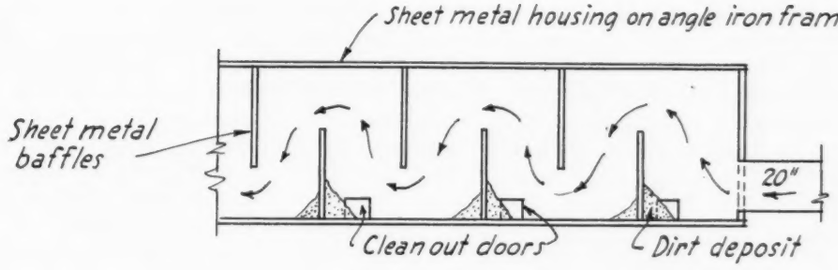


FIG. 4 ELEVATION OF SETTLING CHAMBER

Velocity to be kept below 500 F.P.M, preferably 300 F.P.M. Make unit as long as platform or space allowance will permit.

Welding Procedure for the Sheet Metal Shop

A series of practical articles covering accepted welding practice for light gauge sheet and light structural shapes as used in the sheet metal shop for the fabrication of metal specialties, ventilating work, or general architectural practice. This first article discusses seams.

By J. Carl Wilson

THE fabrication of sheet metal into vessels, receptacles, and containers of various forms, of hollow steel houses, steel floors, steel walls and for innumerable purposes has progressed through the stages of soldered, riveted and the many types of lock seams, many of which are more or less unsightly to the recent introduction of arc welding, now universally recognized as a highly efficient method of joining metals. Welding has produced great changes in the fabrication methods of the progressive sheet metal shop, which has recognized the merits and advantages to be derived from elimination of rivets and lock joints and the greater value of the product with the neat or even invisible seams made by arc welding.

The wide adaptation of arc welding in the sheet metal shop gives need for consideration of the features which have made welding practical. These features are—selling talk, design, cost, preparation, sequence of operation, gauges, jigs, finish of seams and the purpose for which the article is to be used. Space will not permit dealing with all of these features in this article so we will take up selling talk, gauges, types of seams and cost.

Sales talk is something that should not be overlooked. When we can tell the customer that it is possible to replace his equipment with neater and better articles arc welded, he is interested. Salesmen can carry small samples of a welded seam to show the customer by comparison why it is better. This practice has turned many repair jobs into replacement of the article making a more satisfied customer and more profits for the shop. When figuring new work if the contractor can suggest to the architect that a portion or all of the job could better be arc welded, it immediately brands that shop as a progressive firm and makes the contractor a contender for the job even though the bid may not be the lowest. There are many ways the salesman can incorporate arc welding in his sales talk profitably, depending on his particular technique and approach.

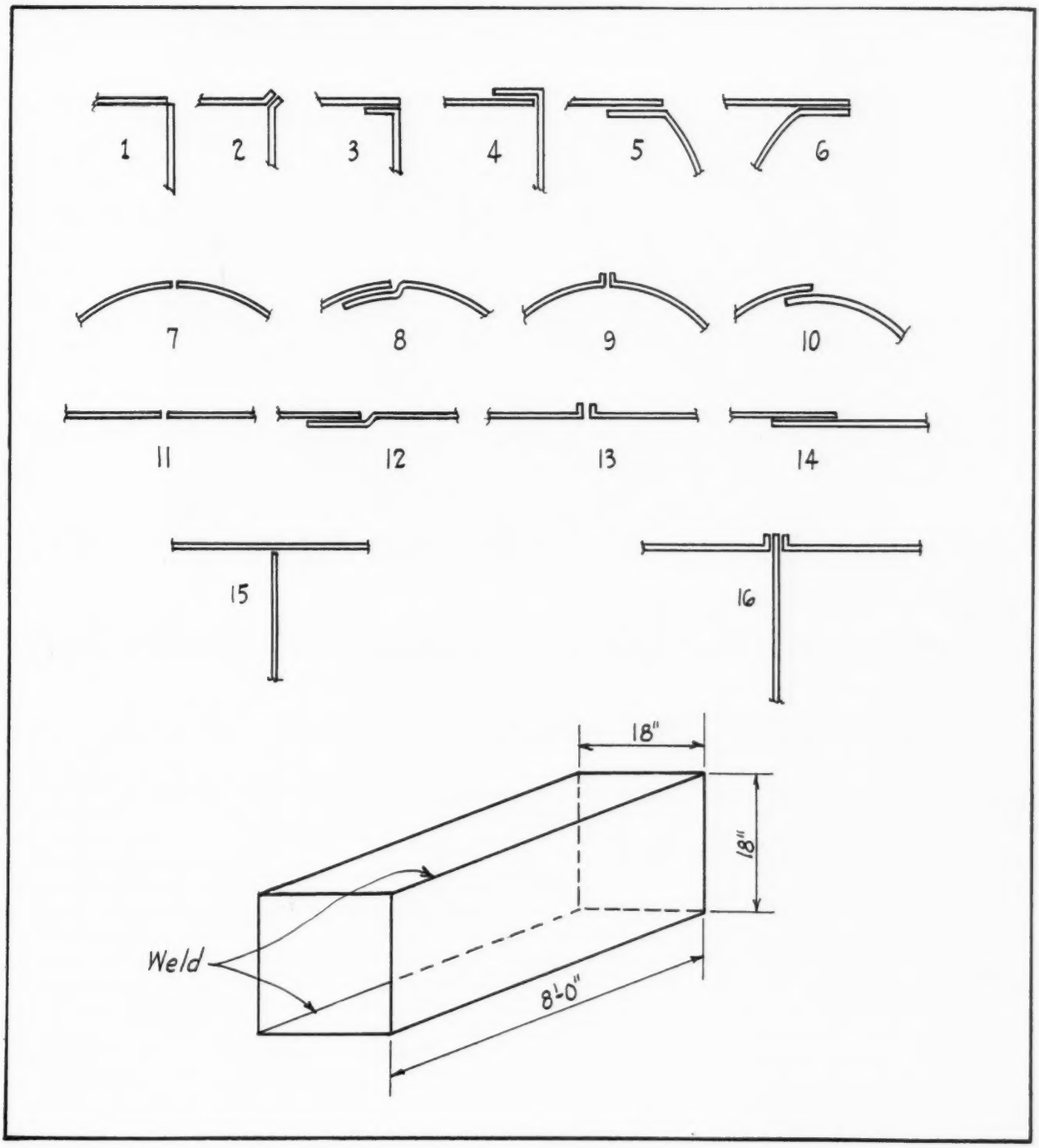
Gauges. Without heavier metal to weld to, 22-gauge material is the lightest it is economically practical to arc weld, although it is possible to arc weld 26-gauge to heavier metal by special automatic machines and water cooled jigs. For large, duplicate production we may arc weld any gauge, but the problem of anything lighter than 26-gauge should be taken up with the welding machine manufacturer, as it is then a specialty and requires an engineer to go over the shop and make recommendations for the problem.

The accompanying details 1 to 16 show different types of seams all of which have their place and merits and will be referred to later in these articles. Seams 1, 2, 3, 4, 5, 6 are the commonest types of corner seams; 7 and 8 are for tanks and pipes; 11 and 12 for flat seams and 16 for partition or Tee seams.

Some shops combine both welding and riveting in the seam, the riveting being performed before the welding. This is not a good practice, indicates a lack of faith in each operation and as for results most of the value of the riveting is lost due to heat absorption which tends to loosen the rivets and subject them and the weld to an initial shearing stress. This is particularly true in sheet metal welding due to the proximity of the weld, this snould be avoided as it adds to the cost and is of no value, as a welded seam, properly made, is stronger than the sheet.

Cost of arc welding as compared to other methods is a matter that requires some thought and planning and probably some changes in equipment and machinery. But welding is not necessarily very expensive, a good welding machine suitable to any type of welding for the sheet metal shop can be purchased for less than $400.00. Jigs and other special equipment usually may be made from the scrap pile at very small expense.

It will be noted in seam details 1 to 16 that considerable time can be saved in forming these seams. Detail 1 is a very good type of seam and will make a first class weld. To rivet and solder this seam means only that we have an extra bend to make, we have about 16 holes to the foot to punch, then we have to drive 8 rivets and solder. This seam fin-

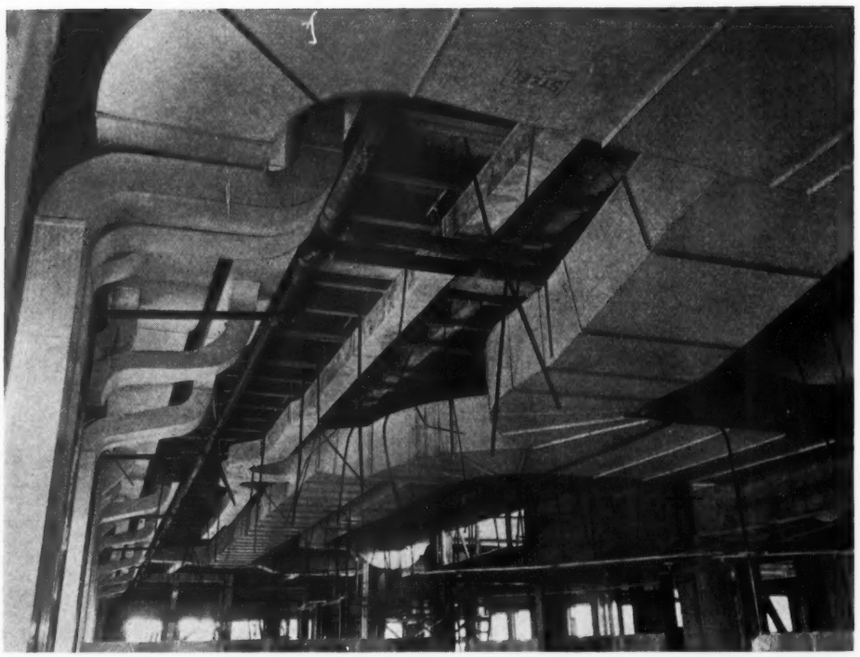


ished is not always nice to look at and on a footage basis is expensive.

It is not at all uncommon for a welder to do 150 feet an hour on this type of welding. As a problem we will take a length of 16-gauge pipe 18 inches by 18 inches by 8 feet. These two pieces have come from the brake and are ready to be assembled. We haven't a special jig and we are only making one piece of pipe, so we have to fit the seams and tack weld about every 8 inches. This will take not more than eight minutes or two feet per minute fitting time. Now for lack of jigs we reduce our welding time to say 60 feet per hour or one foot per minute. We have eight minutes fitting and 16 minutes welding or 24 minutes time to assemble this piece of pipe.

Our labor cost based on $1.00 per hour will be 2.499 cents per foot of seam. Electrodes should not be more than ⅛ pound at 12 cents per pound, or 1.5 cents for electrode. Power cost will vary with machines and localities, but will be around .30 cents per hour or a power cost of 12 cents.

We thus have labor cost plus electrode cost, plus power cost equals 54 cents for this eight-foot piece of pipe with 16 feet of welding. It is to be remembered that jigs will almost always reduce labor cost, so following article will treat of details and jigs that have proven their worth and economy on such articles as tank work, blowpipe work, ventilation work, kitchen equipment, angle iron work, steel houses, aluminum, stainless steel, monel metal and copper vessels.



View of a typical floor showing main run ducts and branches with elbows, standing seam locks and type of branch take-off.

Contractor Employs Unusual Methods for Hanging and Insulating Duct Work

ONE of the largest and most interesting central system air conditioning and ventilating installations of 1935 is now in operation in the home offices of the Upjohn Company in Kalamazoo, Michigan. For air conditioning the installation uses cold city water as the means of reducing temperature and has a capacity sufficient to reduce 40,000 c.f.m. from 85 degrees dry bulb with 40 per cent relative humidity to a wet bulb temperature of 60 degrees. In addition to several interesting engineering features, there are also several unusual fabricating and insulating details.

The general provisions of the contract are expressed by W. J. Temple of the J. A. Temple Company, contractors, Kalamazoo, as follows:

"The Upjohn Company, Kalamazoo, Michigan, one of the leading manufacturers of medicines and pharmaceutical supplies, is known the world over for the quality and characteristics of their merchandise and methods of doing business.

"Sometime ago they began a ten-year building expansion program which included the erection of a new office building, new factory building, a new power plant, concentrate plant, etc.

"It was natural and logical for a company of this kind with resources accumulated from years of successful business, to expect and accept only the best and most modern in construction methods, materials, design, etc., that goes into the building of an up-to-date factory and home office building. Among these items, a complete air-conditioning system was provided to serve the entire office. This system was further augmented by smaller units for departments requiring special features for their successful service and operation.

"The main air supply system, to handle 40,000 c.f.m. consists of galvanized steel ducts ranging from 30 by 90 inches to the smaller ducts, size 6 by 10 inches. After the ducts were erected in place,

Exterior of the Upjohn office building and a new factory building.

they were all covered with Celotex one inch in thickness to serve as an insulator and sound deadener.

"The duct work of the main supply system, as well as the main exhaust system and smaller systems are all rectangular ducts, fabricated by the use of Pittsburgh locks and standing seams. Drive cleats and "S" cleats are used on the ducts of the smaller size. The latest type of grilles and registers were specified.

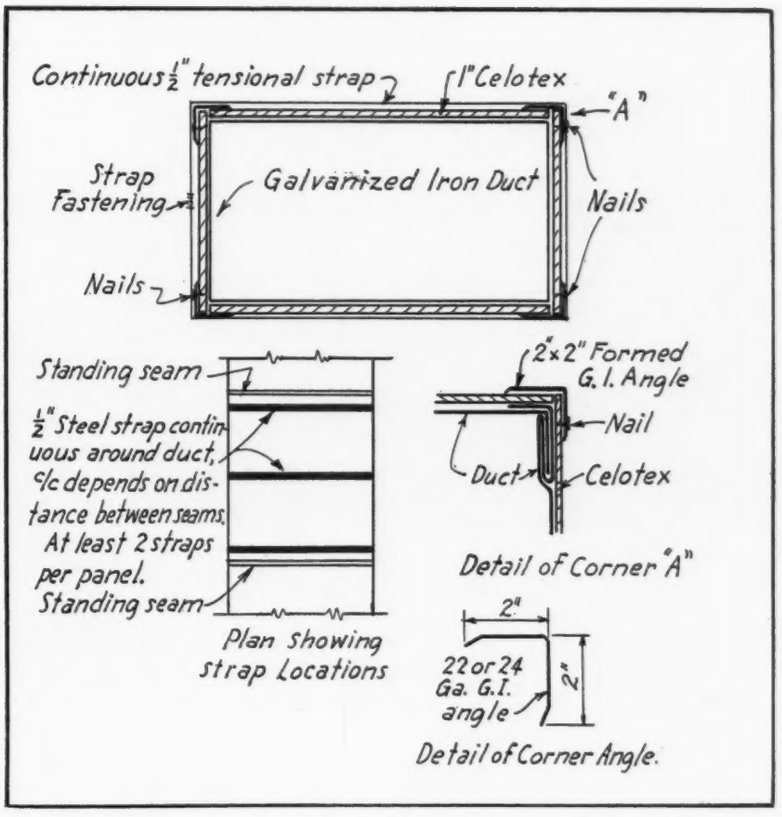
"The duct work required approximately 70,000 lbs. of material.

"Following is a brief set of specifications of the mechanical equipment used in this air-conditioning system. The equipment requiring plumbing and steam fitting was installed by others, but is of the sizes and capacities as listed."

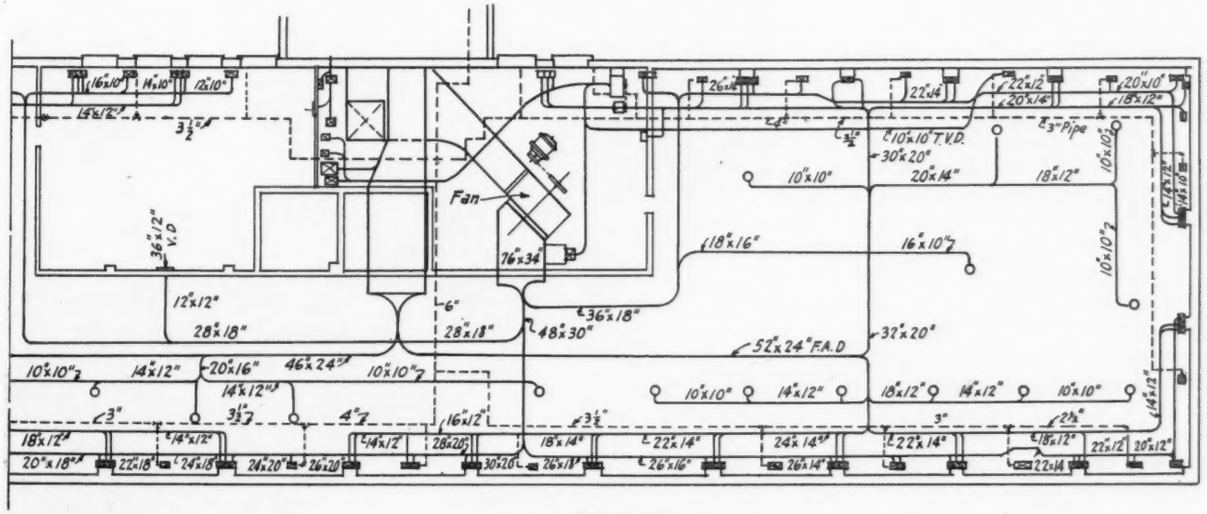
1. Type of Cooling:
   Kalamazoo is fortunate in having cold city water, and the cooling is accomplished by the use of this water in an air washer. The air washer is supplied with 300 gallons per minute of 54-degree water. The capacity of the two-stage washer will reduce 40,000 cubic feet of air per minute from 85 degrees dry bulb and 40 per cent relative humidity to a wet bulb temperature of 60 degrees.
2. Type of Heating:
   Fin Type Steam Coils.
3. Fans and Blowers:
   Supply Fan: 1—Single inlet, with Vortex control, capacity 40,000 c.f.m.—against 1¾ inch static pressure.
   Exhaust Fans: 1—Capacity 32,-000 c.f.m. against ¾ inch S. P.
   1—3,000 c.f.m. against ⅞ inch static pressure.
   1—3,000 c.f.m. ½ inch S. P.
4. Method of Humidifying and De-Humidifying:
   Two-stage Air Washer.
5. Automatic Control:
   Automatic control is used throughout and was erected by the control manufacturers.
6. Air Filter:
   One special air mat filter, capacity 40,000.

In handling the fabricating and erection, the Temple company estab-

(*Continued on page 76*)

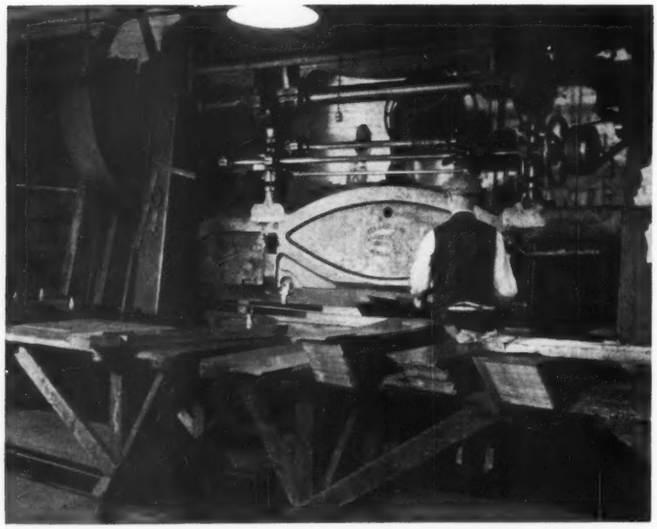


The detail above shows application of the insulation to the ducts. Note the angles which hold the sheets in place and the steel straps which hold all four sides tightly together.



PLAN

Plan view of a pipe space on the third floor showing location of fan and the risers which go to first and second floors. All metal work lies behind a false ceiling.



Shearing Precautions for Bright Metal

In the January issue we presented some of the important characteristics of stainless steels. This article begins a detailed discussion of these characteristics as they affect the fabrication of the material in the shop.

READERS who studied the table of characteristics of bright metals begun in the January issue must have realized that each of the several general types of stainless steels possesses characteristics which make its handling and fabrication a special problem in order that costs will not be excessive and that the resultant item is as serviceable as the material used.

Column seven of the January tabulation (headed Cold Working Properties) refers primarily to the deep drawing of the material, but also gives an insight to some of the practices which must be employed when bright metal is put through the shears, punches, dies, brake and so forth. While most of the manufacturers reported the cold working properties "good" they undoubtedly had in mind that the fabricator would employ methods and equipment suitable for the operation under consideration.

Shearing

For example, take the problem of cutting the sheets. Possibly this operation of shearing will be one of the first operations used on any piece of work. Shearing need not be unduly complicated, but to do a good job of cutting stainless steel sheets, certain fundamental principles must be kept in mind.

In most shops all materials are cut in the shears with the knives varied in set only as the sheet increases in thickness. Also dull knives may be used and while a dull knife may be all right for galvanized iron the same blade will not be satisfactory for stainless steel. Why? Because practically all the stainless steels used by our industry possess ductility, strength and the characteristic of "work hardening" upon small provocation. Also stainless steel to use shop parlance is "tough" and will not "break off" when the shear blade is only partly through the sheet.

When a dull knife is used and especially when the set between the blades is too wide stainless steel shows a tendency to bend over the lower blade and work harden. Further, most of the stainless steels because of greater ductility and "toughness" do not break through when the blade has penetrated part way through the sheet, so the cutting operation must be completely through the material.

Because of this characteristic, the blades should not only be sharp, but should also be set close together.

In this connection attention should be called to a common error —the attempt to cut several sheets as a bundle. With stainless steel in the ordinary shears this is not possible. Because each sheet must be cut clear through and does not break off, when several sheets are put through the shears at once the lower sheets do not break off, but turn down resulting in a ragged and bad

(*Continued on page* 74)

A typical unit made from stainless steel. Above—shearing operation on dull finish stainless steel sections in a power shear.

The 1936 Michigan Convention

CONTRACTORS from Michigan attending the twenty-fifth annual convention of the Michigan Sheet Metal and Roofing Contractors' Association, March 3, 4, 5 in Detroit were given a chance to sample a meeting in which business and addresses were restricted to the very minimum of time and visiting and social activities were very much to the fore front. From comments heard on every hand, this new style program met with practically unanimous approval.

In addition to short sessions which began late in the morning and afternoon and closed before anyone got tired, leaving plenty of time for visiting, the members were conducted on a tour through the Ford Greenfield Village, entertained at a buffet supper with all the trimmings and a banquet by the auxiliary. Those who wished to participate did so; those who preferred to sample hospitality throughout the hotel found plenty of entertainment.

Heating Problems

The convention was given official city welcome by J. A. Kelley, corporation counsel; which welcome was officially accepted by president William Busch. At the heating session, J. S. Clark, president of the Detroit heating men's association declared that one of the gravest problems confronting the trade is the sale of heating and air conditioning apparatus by such firms as the J. L. Hudson Co., one of the cities largest department stores. Recently this firm's activities were bitterly protested by Detroit plumbers and steam fitters, but, said Mr. Clark— "We furnace men are the ones who ought to be protesting. The plumbers say they do 90 per cent of the air conditioning work, whereas we know that in 1935 at least 98 per cent of all heating systems installed in our area were warm air heat and were installed by furnace men. If our association is not joined by the hundreds of installers not members, our protest will bear little weight. We propose to combat this evil by getting an ordinance and licensing regulation for Detroit. We plan to follow the general outline of the Minneapolis code (see American Artisan for October, November, December, 1935; January, March, 1936) with such changes as required to meet our particular problems. If we are strong enough we can make such operations outside the law, but we'll need the assistance of every member of the industry."

E. C. Carter, Snips, stated that from all indications air conditioning will be one of the three or four largest industries within a very few years. It has become so attractive that the largest corporations in the country are either launched in a program of developing apparatus and setting up sales agencies or are studying the field to see how they can participate. Many of these large

●

OFFICERS

President — Peter Wierenga, Grand Rapids.

V. President—James Hage, Flint.

Treasurer — Homer Brundage, Kalamazoo.

DIRECTORS

W. W. Busch, Detroit.

Guy Van Dorn, Jackson.

Tom Marshall, Detroit.

Edward Ewer, Lansing.

AUXILIARY OFFICERS

President—Frank Roberts, J. M. & L. A. Osborn Co.

V. President—Harry Ward R. C. Mahon Co.

Sec.-Treas. — Alfred Green, National Lead Co.

Sergeant—Earnest Overbeck, Rissing, Nelson Slate Co.

●

firms do not want to do any installing. They want to sell the apparatus and take the equipment profit and leave to the installer the grief and smaller profits from metal work and installation.

Mr. Carter cited the development of air conditioning specifications backed by steam and hot water heating contractors in large cities like Chicago as one of the serious problems which must be met. He showed how in Chicago an initial program of publicity by the steam men has now been counteracted by an ever larger program by the warm air and air conditioning contractors. He declared that too often the furname man fails to designate himself through advertising or even an outside sign as an installer of air conditioning systems and too few contractors ever try to display working units of the apparatus they handle.

The Republic Steel Corporation showed its moving picture film depicting the manufacture and use of stainless steel.

Old Age Security

H. R. Cooper, senior accountant, National Security Board of Washington, gave a splendid address on the old age and unemployment security act. He pointed out that persons beyond 65 are increasing in number and that unemployment must be solved by a well planned program and not by the expensive and uncertain methods of former years. These acts set up the machinery whereby cooperative Federal and State efforts can (1) provide help for aged, blind, needy; (2) grant financial aid to those needing it in the future; (3) set up a form of Federal old age benefit according to state specifications; (4) set up a means for alleviating unemployment distress.

In general these various acts provide a means whereby the Federal government matches dollar for dollar the funds of states cooperating through approved laws. States have wide latitude in the provisions of their acts excepting that each state law must cover the entire state and be mandatory over all counties; be supervised by a central state agency; states must help finance; no state age limit can be higher than 65.

In briefly outlining some of the provisions of the act, Mr. Cooper said that by 1960 at least 9 per cent of our population will be persons older than 65 and that the age limit in many industries is constantly dropping to the younger men. After 1942 those persons beyond 65 who have made at least $2,000 in the past five years will receive Federal benefits ranging from $10 to $85 a month. The cost will be financed

(*Continued on page* 74)

The Minneapolis Heating, Ventilating and Air Conditioning Ordinance [Part 5]

1204.4 Gas Burning Furnaces, Conversion Type: Where a gas burner is to be installed in a furnace not specifically designed for the exclusive use of gas as a fuel such furnace shall be selected as provided in Section 1204 and Sub-Section 1204.1 of this ordinance as for solid fuel burning furnaces and with the additional requirements that the heating surface to grate area ratio of such furnace shall be not less than 20 to 1. Where such ratio is less than 20 to the next larger size furnace shall be used.

1204.5 Gas Burning Furnaces, Unit Type: Where a furnace is specifically designed for the use of gas fuel only and has one or more gas burners incorporated as an integral part of said furnace, the whole being sold as a single unit, then the capacity or output in B.T.U. per hour available at the bonnet shall be determined by the following formula:

Output Rating = 0.75 × Input Rating

Section 1205 Furnaces, Construction and Installation of: The construction and installation of all warm air furnaces hereafter installed in connection with mechanical warm air heating and air conditioning plants in the City of Minneapolis shall, except as elsewhere in this ordinance otherwise provided, comply with the following requirements:

1205.1 Foundations and Other Supports for: Shall be as provided for in Sub-Section 1105.2 of this ordinance.

1205.2 Setting or Assembling of: Shall be as provided for in Sub-Section 1105.3 of this ordinance.

1205.3 Casings: Casings shall be constructed of galvanized iron, 26 gauge or heavier or they may be constructed of masonry. Galvanized iron casings shall be lined with black iron liners, extending from the grate level to the top of the furnace and spaced from one (1) inch to one and one-half (1½) inches from the outer casing. Casings for commercial or heavy duty casings, if built of galvanized iron, shall be insulated with fireproof insulating material at least two (2) inches thick. Casings may be either round or square. The hood or bonnet of the casing above the furnace shall be as high as practicable to form a plenum chamber over the top of the furnace.

Any furnace, the casing top of which shall come within twelve (12) inches of a combustible floor, ceiling or joist, shall be protected by a metal shield, extending not less than eighteen (18) inches beyond the casing of said furnace. Any furnace casing or top coming closer than six (6) inches of a combustible ceiling or joists shall be provided with at least one and one-half (1½) inches of magnesia or equivalent incombustible insulation in addition to the metal shield.

1205.4 Baffling: All furnace casings shall be equipped with baffles so constructed and placed as to force impingement of air against the heating surfaces of the furnace, unless furnace body is so constructed as to provide this baffling effect.

The first Minneapolis code was formulated in 1926. This revised code, effective this spring, was written chiefly by the Building Inspection Department from its experience.

The first part of the ordinance, published in our October issue, covered methods of securing contracts. The second article (November) covered the selection of smoke pipe sizes and design of gravity systems. The third article (December) covered setting the furnace, wall stacks, leaders, return air. The January issue covered design of forced warm air systems.

◆

1205.5 Smoke Pipes: Smoke pipes shall be constructed and installed in accordance with the provisions of Sub-Section 1105.9 of this ordinance.

Section 1206. Headers When: Spacing of Studding and Joists: Shall be as provided for in Section 1107 of this ordinance.

Section 1207. Fans, Method of Selection. The following provisions shall govern the selection of a fan or blower for installation in any mechanical warm air heating or air conditioning system: Select a fan which, according to its manufacturer's certified rating, is capable of delivering a volume of air, expressed in cubic feet per minute (as determined in Section 1202 of this ordinance) against a frictional resistance, expressed in inches of water, computed by adding together the following items:

(a) The frictional resistance of the warm air trunk or leader having the greatest resistance.
(b) The frictional resistance of the return air trunk or leader having the greatest resistance.
(c) The resistance to the flow of total volume of air through the furnace casing or hood, which shall be considered to be not less than from 0.10 to 0.15 inches of water, depending upon furnace and casing construction.
(d) The frictional resistance through any other accessories, such as washers, filters, etc.
(e) A factor of safety of ten (10) per cent of the resistance calculated above.

Section 1208. Filters: Air filters shall be so installed as to be readily accessible for inspection and removal for cleaning or replacement. Duct connections to and from filters shall change size or shape gradually to insure even distribution of air over entire filter area. Filters installed close to outside air inlet shall be protected from the weather by suitable louvers in front of which a one (1) inch mesh wire screen shall be provided.

Section 1209. Air Washers: The following provisions shall govern the design, construction and installation of air washers when incorporated as a part of any mechanical warm air heating or air conditioning system:

(a) Air shall be uniformly distributed over washer inlet.
(b) Spray nozzles shall be so spaced and arranged that spray will completely cover cross sectional area of washer above tank.
(c) Air velocity through washer shall be not less than 300 feet per minute nor greater than 600 feet per minute.
(d) Provision shall be made to prevent entrained moisture being carried past washer outlet.
(e) Drain and overflow connections from washer tank shall not be direct connected to sewer or waste line but shall in all cases drain to open receptacle.
(f) Fresh water connection shall be so arranged that there will be no possibility of tank water being drawn back into water supply line in the event of lack of pressure in supply line.

Section 1210. Controls: Mechanical warm air heating and air conditioning systems hereafter installed shall be equipped with automatic controls capable of performing at least the following minimum functions.

1210.1 Oil Fired Furnaces: At least three thermostats shall be employed as follows: Thermostat No. 1 will stop the burner when the room temperature is too high and No. 2 will stop the burner when the temperature of the air in the plenum chamber or main duct exceeds the setting of thermostat No. 2. Both temperatures must be below their respective settings to start the burner. Thermostat No. 3 responds to the flame temperature and in conjunction with the control switch acts as a safety to stop the burner if the latter fails to ignite or burn properly as demanded by thermostats No. 1 and No. 2.

1210.2 Gas Fired Furnaces: Shall employ thermostats No. 1 and No. 2 as for oil fired furnaces. Either a thermostatic pilot, so constructed and adjusted that no gas can flow through the main burner unless the pilot flame is burning, or some other similar type of safety device serving this same end, shall be employed. The operation of this safety device shall not depend on the closing of an electric circuit to shut off the main gas supply. A gas pressure regulator shall be installed on all gas fired furnaces.

1210.3 Stoker Fired Furnaces: Shall employ thermostats No. 1 and No. 2 as for oil fired furnaces.

Section 1211. Noise Elimination: The fan blower housing shall not be directly connected with metal, either to the furnace casing or to the return air piping. Canvas strips may be used in making these connections.

(Continued on page 78)

AIR CONDITIONING SECTION

WE wish to call readers' attention to this month's article by Mr. Konzo on the resistance of registers. This article is important because contractors have been using the new types of deflecting registers and neglecting the fact that these registers which disperse the air stream have considerably more resistance than straight flow types.

- - - If you are using these deflecting registers remember that they impose more resistance on the fan and that higher velocities and greater air pressures are required to "get air to a certain spot" than with the straight flow types.

- - - Mr. Konzo sets up a comparison in resistances and supplies suggestions for necessary velocities and pressures. These facts may account for some of the poor air distribution installations contractors write about.

MERCOID

AUTOMATIC FAN OR BLOWER CONTROL

IT NEVER FAILS ON THE JOB

The Mercoid Type M-53 Fan or Blower Control gives positive, accurate and dependable service over a long period of years.

This control is equipped with a sealed mercury contact switch. It cannot be affected by dust, dirt or corrosion. There can be no open arcing, or pitting of contacts. It will operate indefinitely without any deterioration.

A unique and valuable feature is the visible dial which indicates the temperature in the furnace hood. It also shows at a glance the temperatures at which the instrument is set to operate.

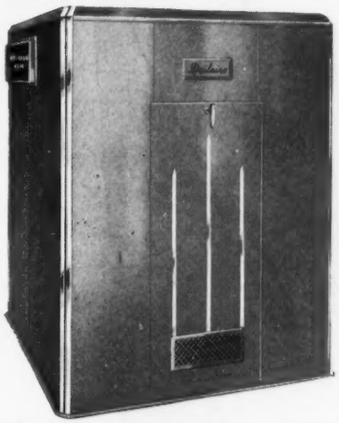
Complete catalog of Mercoid Controls sent upon request.

THE MERCOID CORPORATION, 4209 Belmont Avenue, Chicago, Ill.

IT PAYS TO GET THE BEST

Dailaire Systems of

• HEATING
• COOLING *and*
• AIR CONDITIONING

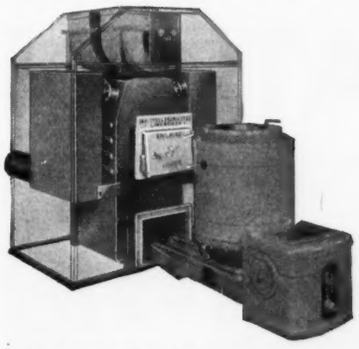


Showing the complete Dailaire Air Conditioning System encased in the New Dailaire Casing. Housing Oil and Gas Burner, Blowers, Washers and Filters.

SINCE 1930 Dailaire has Pioneered the most outstanding engineering in special oil burning furnace construction.—During these six years, step by step Original features have been added.—The 1936 Dailaire line is compact, efficient and attractive, and embodies exclusive and outstanding features, not found on any other Heating and Air Conditioning System as follows—

NOTE JUST 6 OF THESE FEATURES

(1) Stainless Steel Combustion Dome
(2) Divided Flue Construction
(3) Overhead Multiple Blower inside of casing
(4) Washers and Filters in side of casing
(5) Cooling Coils inside of casing
(6) Preheating Air before Washing (giving increased humidity)

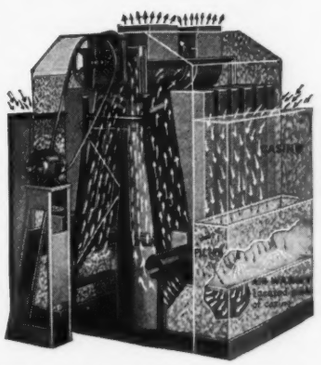


This shows one of the 44 different combinations of Dailaire Coal burning units, that are giving heating efficiency of 70 to 75%.

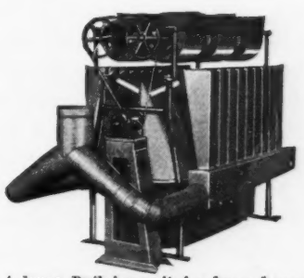
In over 27 states, in all climates, Dailaire Furnaces whether for Oil, Gas or Coal are giving heating efficiency of 75% to 85%. Therefore, Mr. Dealer, make no mistake about 1936—it's going to be a big year for Dailaire.

Remember Dailaire is a Pioneer and built in sizes and styles, making a complete line to fit every need of the Industry. Write us today for Illustrated catalogue and see why Dailaire can make profits for you.

This shows one of the 18 different sizes and combinations in Dailaire Hot Water or Steam Split Systems. All combinations can use Cooling if desired.



Showing the compact arrangement of various phases of air conditioning in the Dailaire system.



A large Dailaire unit for large homes, factories and public buildings.

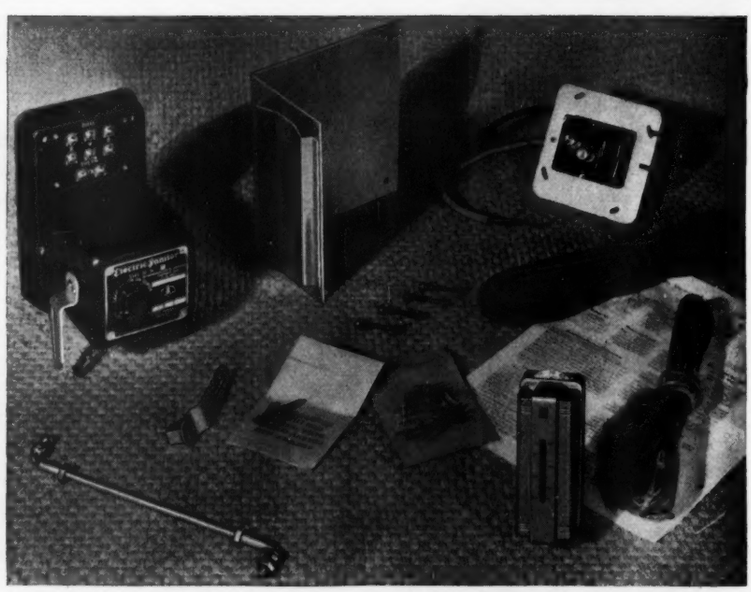
DAIL STEEL PRODUCTS COMPANY
1050 MAIN STREET
LANSING, MICHIGAN

COMPLETE CONTROL for Every Warm Air INSTALLATION

MINNEAPOLIS-HONEYWELL now has available complete control package combinations for every type of warm air installation. Each is complete in itself, including all fittings and accessories, ready for the specific type of warm air installation you are making, whether it be a zone control job (illustrated), a simple damper regulator, or a forced air installation. Controls are available for all types of heating, ventilating and air conditioning equipment for all buildings, old or new, large or small. The consultation services of a Minneapolis-Honeywell Engineer in or near your city are available to you without cost or obligation at all times. For information on warm air control packages write Minneapolis-Honeywell Regulator Co., 2726 Fourth Ave. So., Minneapolis, Minn.

■

Branch and distributing offices in all principal cities. In Canada: Minneapolis-Honeywell Regulator Co., Ltd., 117 Peter Street, Toronto, European sales and services: 233 Heerengracht, Amsterdam, Holland.



ZONE CONTROL PACKAGE FOR WARM AIR INSTALLATIONS

MINNEAPOLIS-HONEYWELL
Control Systems
BROWN INSTRUMENTS FOR
INDICATING, RECORDING AND CONTROLLING

AMERICAN *Throway* FILTERS

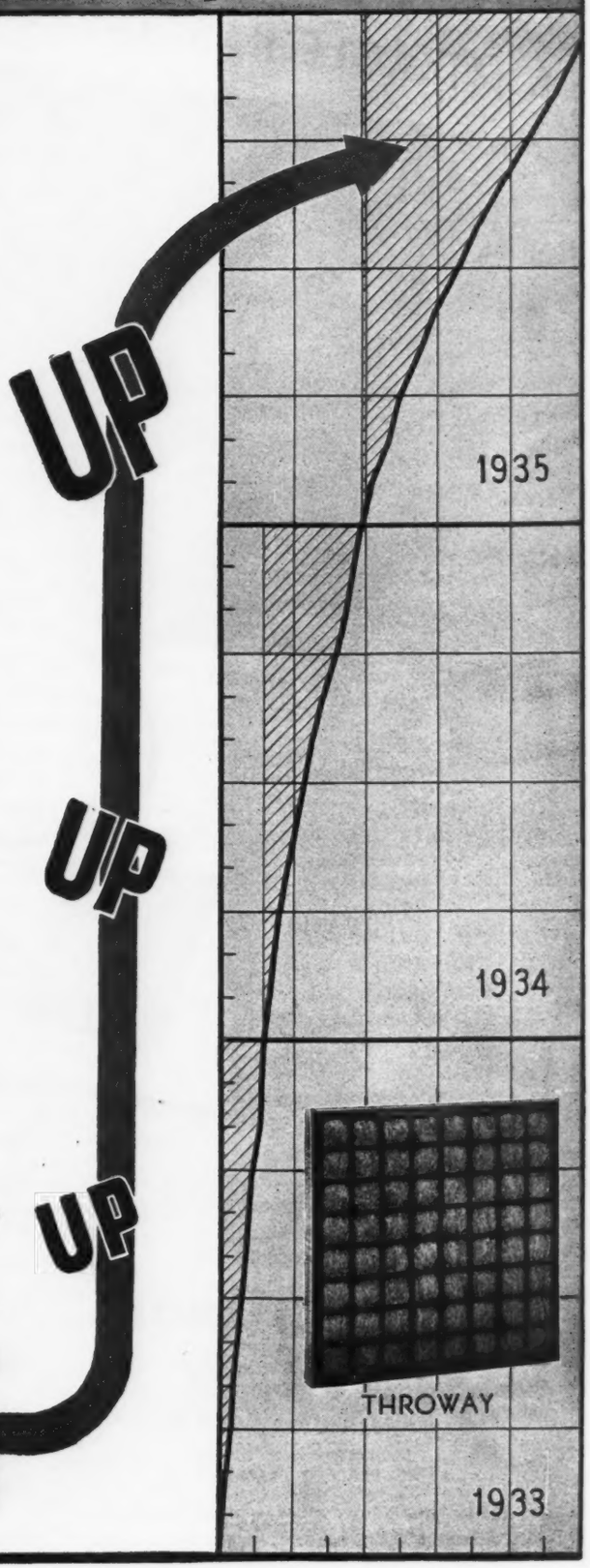
A 90% INCREASE MADE IN 1935!

● This tremendous gain in the sale of Throway filters was due to their more general use by manufacturers of warm air heating and domestic air conditioning systems. A great many of these manufacturers who had not previously used Throway extensively, adopted them as standard equipment in 1935.

As there has been no basic change in the design of this filter since it was developed and introduced in 1932, this greater acceptance and increased use was due entirely to its superior performance. No other filter has the desirable performance characteristics obtained with the patented split-wire filtering media in the Throway—high efficiency—low resistance—large dust holding capacity. If you are using the Throway, your judgment is confirmed by the leading manufacturers in the warm air heating and air conditioning field who have standardized on this filter—otherwise, you should investigate.

Write for Bulletin 117-C

American Air Filter Co., Inc.
Incorporated
113 CENTRAL AVE., LOUISVILLE, KY.
In Canada; DARLING BROTHERS, LIMITED, Montreal, P. Q.



GOING

2,823,055 READERS

of the March 21st SATURDAY EVENING POST will read about **Clean Warm Air** ...will be invited TO SEE **YOU** about installing **DUSTOP**

THE SATURDAY EVENING POST
March 21, 1936
A MIRACLE HAS HAPPENED
"Baby and I breathe clean, pure air at home. Germ-laden dust is filtered out... by GLASS"
THE SAME MIRACLE CAN HA
ust-Stop Air Filters, b
to your home. Ask your heating con-
tractor today about installing Dust-Stop Air
Filters in your present warm-air heating
system—or, if you are thinking of buildin
a new home, insist upon warm-air h
ered with Dust-Stop Air Filters.
● You, too, can breathe clean air through your warm-air heating system. Dust-Stop Air Filters, easily and quickly applied by your heating contractor, are inexpensive and do just what their name implies . . . stop dust, with its billions of infinitesimal, germ-laden particles, from entering your rooms through warm-air pipes. Dust-Stop Air Filters contain a fireproof mat of FIBERGLAS, an amazing new kind of glass with long, slender, intertwining fibers whi with an adhesive th lint and pollen. equipped with Du from room to r walls, curtains an is drawn to your ha clean air is recircu curtains, drapes and much less arduous task. Truly
OWENS-ILLINOIS Glass IN DUST-STOP AIR FILTERS
Fiber FOR WARM-AIR SYSTEMS
For the more economical operation of your warm-air heating system—and for summer comfort too, have your home insulated with Red Top Insulating Wool, another form of Owens-Illinois Fiberglas distributed by the United States Gypsum Company.

● **Prospects are already sold on the health, cleanliness and economy of clean, filtered air—eager to obtain these by installing DUST-STOP. Are you ready to serve this market which Owens-Illinois is assisting in creating?**

Contact your distributor who carries complete stocks of DUST-STOP Replacement-Type Air Filters, or write Owens-Illinois Glass Company, Industrial Materials Division, Newark, Ohio.

OWENS-ILLINOIS
Fiberglas
DUST-STOP AIR FILTERS
INSULATING BLANKETS
PIPE INSULATION
DISTRIBUTED BY OWENS-ILLINOIS GLASS COMPANY
...and "RED TOP" *Insulating Wool, distributed by United States Gypsum Co.*

Dust-Stop installed in Canada by General Steel Wares, Ltd., Toronto

Converting Old Gravity Systems To Forced Warm Air

The design procedure used in new installations must be modified in conversion work because of the limiting conditions of stacks, registers, pipes and the owner's unwillingness to have his house torn up. This series of articles will explain how our usual engineering principles are adapted to these problems

By G. A. Voorhees
Chief Engineer
Furblo Company

IN the preceding article of this series, attention was directed to the importance of letting a "doubtful room" (room 24, in Fig. 1) show us the limiting values of register air temperature and air velocity in the ducts, which could be used as a design basis for remodeling an old gravity furnace plant into a modern, efficient, forced air system. The subject is important enough to warrant further discussion.

What is a doubtful room?

Probably it's a second floor room; less often is it a first floor room. Specifically it's a room the gravity warm air supply duct to which *may* be too small for satisfactory forced air heating. On a conversion job, the original leaders to first floor rooms, while they may have been too small for adequate gravity heating, are nearly always large enough for forced air.

But it will often be found that wall stacks are not only too small for adequate gravity heating, but are even too small for an efficient forced air system, unless the remodeled plant is designed on the basis of a higher register temperature and a more rapid air flow in the ducts than we may be in the habit of using.

Since the only function of "practical" engineering is to help the heating contractor make a profit, we must look to engineering to tell us whether or not we can safely guarantee to heat the second floor or "doubtful" rooms using the wall stacks which are already in place.

If we can avoid the expense of additional wall stacks by designing for a higher register temperature than we would ordinarily use for a new system, then design on the basis of that higher register temperature *IF* it is not unreasonably high.

If we can avoid additional stacks by forcing the air through the old risers at a higher velocity than we customarily use for new jobs, then design on the basis of this higher velocity, provided, again, that the velocity chosen is not *unreasonably* high.

This brings us face to face with two questions which perplex many furnace men.

(1) What is a "reasonable" register temperature to use as a design basis?

(2) What is a "reasonable" air velocity in the ducts to use as a design basis?

For several years past the writer has made it a point to inquire about register temperatures and duct velocities preferred as a design basis by successful forced air heating men in various sections of the United States and Canada. After learning what register temperature and air velocity is considered a *desirable* average, the next question asked has been, "What do you consider the *highest allowable* average register temperature and the highest allowable duct velocity in designing a forced air system for a residence?"

The answers show the preferred temperature to average about 145° to 150° and the air velocity in wall stacks about 500 feet per minute.

These have been the "preferred" values where the furnace is coal fired. In oil and gas furnaces where heat is generated intermittently instead of continuously as with solid fuel there seems to be a preference for lower average register temperatures so that the "on" periods will be longer and the "off" periods

THIS question is frequently asked —"Why do engineers harp so much on figuring the heat requirements of second floor rooms for a forced air system when those rooms are usually used only for sleeping and we never gave as much attention to them as we did to first floor rooms in gravity heating work?"

That is a sensible question and important. The answer is that when we convert a system from gravity circulation to forced air circulation, your customer EXPECTS very much better heat. Even on gravity furnace replacements, when you installed a new furnace, even though you didn't make any changes in the piping system, your customer EXPECTED better heating results.

To an even greater extent he demands more adequate heating when you incorporate a blower as a part of the installation. He usually takes for granted that the blower WILL MAKE HIS HEATING PLANT HEAT. At least four times out of every five that is the attitude of the buyer, and unless you handle your conversion jobs accordingly you're headed straight for customer dissatisfaction and adjustment expense. If to the cost of converting a plant from gravity to mechanical circulation, we add the expense of installing additional stacks when the rooms could be heated with the present risers, we are lessening our chances of making the sale.

While it's true that we should not "skin the job" for the sake of holding our price down, it's equally true that there is no justification for adding UNNECESSARY items of labor and material. On conversion jobs, the cost of installing new risers to upstairs rooms is relatively high, hence, we should avoid including additional wall stacks in the cost estimate of the job IF THEY ARE NOT NECESSARY.

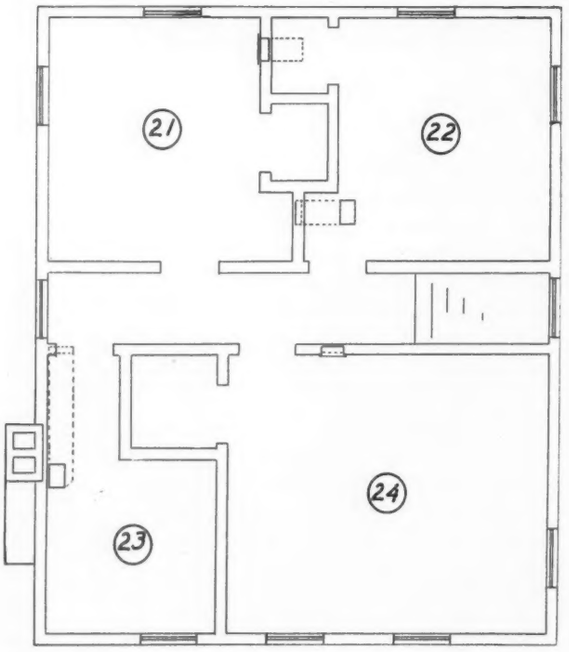


Fig. 1—Plan of a second floor in which room 24 is the "doubtful" room because it is the largest and most exposed.

shorter. Opinion is more pronounced for coal fired furnaces than for oil or gas fired heaters, but it is safe to say that the preference as to register temperatures seems to be about 10° lower for an intermittently fired (oil or gas) plant than a continuously fired (coal) plant.

For both intermittently fired and continuously fired furnaces, most experienced contractors seem to consider that the maximum allowable register temperature to be used as the design basis should not be more than 10° above the "preferred" temperature. Thus the heating contractor who usually designs new systems on the basis of an average register temperature of 140°, may design conversion installation at 150°. If his preferred basis is 145° he places his maximum at 155°; if his preferences is for 150°, he's not willing to design for higher than 160°.

For air velocities in warm air supply risers, most of the heating contractors consulted express preference for velocities ranging from 450 up to 600 feet per minute with the average preference at about 500 F. p. m. Some few who design their completely new installations for velocities as high as 700 or 750 feet per minute in the risers stated emphatically that they would not approve of these velocities for an old plant being remodeled from gravity to forced circulation unless they could install new risers having "easy" curves rather than sharp bends as found in so many old jobs. In general, it seems probable that a velocity of 500 F. p. m. may be taken as representing a fair average of the practice of experienced forced air heating men for remodeled jobs with 600 F. p. m. or possibly as high as 650 F. p. m. the maximum permissible velocity for such plants.

For those readers whose experience in designing forced air heating systems is limited, the following recommendations based on the opinions of a large number of successful and experienced heating contractors are offered:

(1) The preferred average register temperature is 150°.

(2) The recommended maximum register temperature is 160°.

(3) The preferred air velocity in risers is 500 F. p. m.

(4) The recommended maximum riser velocity is 600 F. p. m.

If we tabulate register temperatures in the order of their preference, listing 150° as the most desirable, 155° next and 160° last, and for velocities list 500 F. p. m. as first preference, 550 F. p. m. next and 600 F. p. m. last, and if for each combination we show the heat delivery at the register in B. t. u. per hour (taken from Table 1 in the preceding article of this series), we find that as shown in Fig. 2, we can estab-

Windows and Outside Doors			No. of Room 24	Floor 2
Size	No.	Area	Name of Room Bed	
2½ × 5	3	38	Dimensions 12 × 14	
			Ceiling Height 8	
			Exposed Wall Running Ft. 26	
			Gross Area Exp. Wall 208	

		Factor	B.t.u.or E.b.f.
Total Glass Surface =	38	12	3.2
Net Exposed Wall =	170	60	2.8
Cold Inside Partitions =	—		
Cold Ceiling =	168	50	3.4
Cold Floor =	—		
Leakage Loss =	2016	800	2.5
Miscellaneous Data pertaining to this room. Cubic Content 1344		Sub-total	11.9
		Add for Temperature	
		Sub-total	
		Add for Exposure	
		Room basic factor or B.t.u. per Hr.	11.9

A sample data sheet for one room with heat loss calculated according to the mechanical code. One-half a factor should be added for exposure.

Preferred Air Velocity in Riser F.P.M.	500	550	600	Preferred Register Temp.	Order of Preference
Order of Preference	1st	2nd	3rd		
1st	283	311	339	150°	1st
2nd	299	329	359	155°	2nd
3rd	315	346	377	160°	3rd
4th					
5th					

Heat Delivery per Sq. In. Riser Area — Order of Preference — Average B.T.U. per Hour: 1st 283; 2nd 305; 3rd 324; 4th 353; 5th 377

Fig. 2

This short form gives at least two selections for register temperature, velocity and B.t.u. delivery per square inch of riser pipe.

lish the heat delivery per square inch of riser area. The practical value of this is to enable us to determine quickly whether or not existing wall stacks are of a size which will permit us to use them for the remodeled system and keep within our "reasonable" design basis.

Divide the heat loss of room 24 expressed in B. t. u. per hour (which is equal to the Room Basic Factor multiplied by 1000) by the cross sectional area of the wall stack in square inches. The quotient thus obtained is the required heat delivery of the riser expressed in B. t. u. per hour per square inch of riser area. Compare this with the tabulation of heat delivery per square inch of riser area shown in the inclined column of Fig. 2 as shown by the following examples:

1. Suppose that the Room Basic Factor is 12.4 (see data sheet Fig. 3) and that the room receives its heat supply through a 3-in. by 13-in. riser. The heat loss of the room is $1000 \times 12.4 = 12{,}400$ B. t. u. per hour. The cross sectional area of the riser is $3 \times 13 = 39$ square inches. Hence, to heat this room with the present wall stack, will require the delivery of $12{,}400 \div 39 = 318$ B. t. u. per square inch of riser area per hour. Referring now to the inclined column in Fig. 2, we see that neither the 1st nor 2nd choice as to "preferred" heat delivery per square inch of riser, will satisfy the conditions, but the 3rd choice, 324 B. t. u. per sq. in. per hour, will take care of it.

Projecting upward and to the right in Fig. 2, from the 324 B. t. u. "average" heat delivery, we see that the following B. t. u. deliveries may be obtained with the combinations of register temperature and air velocity shown:

B. t. u. per hour heat delivery per sq. in. riser area	Register Air Temp.	Air velocity-in riser, f.p.m.
315	160°	500 f. p. m.
329	155°	550 f. p. m.
339	150°	600 f. p. m.

Hence, we may design the remodeled plant for any one of these combinations of register temperature and duct velocity, with the assurance that the converted system has supply duct capacity sufficient to heat the room we have just been considering. Assuming that this room is the "doubtful room" of the job, it means that the revamped plant designed on the basis of either of these three temperature and velocity combinations will have a supply duct system which meets the requirements of all rooms.

TABLE II

Heat Delivery B.t.u. Per Hour Through 3 x 12 Riser At Various Register Temperetures and Air Velocities in Riser

F.P.M.	REGISTER TEMPERATURE 135°	140°	145°	150°	155°
400	6,700	7,200	7,700	8,100	8,600
425	7,100	7,600	8,100	8,600	9,100
450	7,500	8,100	8,600	9,100	9,700
475	7,900	8,500	9,100	9,700	10,200
500	8,400	9,000	9,600	10,200	10,800
525	8,800	9,400	10,100	10,700	11,300
550	9,200	9,900	10,500	11,200	11,800
575	9,600	10,300	11,000	11,700	12,400
600	10,000	10,800	11,500	12,200	12,900
625	10,600	11,200	12,000	12,700	13,400
650	10,900	11,600	12,400	13,200	14,000
675	11,200	12,000	12,900	13,900	14,400
700	11,600	12,400	13,300	14,400	15,000

It will be noted that, whereas the calculations showed that the riser must deliver 318 B. t. u. per square inch per hour, the combination of a register temperature of 160° and an air velocity in the riser of 500 f. p. m. delivers only 315 B. t. u. per square inch of duct area per hour. Such a difference is easily taken care of by adjusting the dampers of the system (if necessary) so as to slightly increase the air velocity in the wall stack to this room. Or the plant will automatically take care of the slight deficiency in stack area by an equally slight increase in register temperature.

Keep in mind that in heating plant design, we do not deal with absolutely fixed values. If any heating plant actually operates at the exact register temperatures and air velocities assumed as a basis for design, it "just happens that way." All that we can hope for is that the plant will operate in a manner which more or less closely *approximates* our design basis.

If we accept the "average" values of the preferences as to register temperature and duct velocity expressed by a number of successful forced air heating men and tabulated in Fig. 2, we see that for the example we are now considering (a room having a heat loss of 12,400 B. t. u. per hour), we could still stay with in the "preferred" limits as to design basis if the available riser had been as small as 3-in. by 11-in. In that case, the cross sectional area would have been 33 square inches and $12{,}400 \div 33 = 378$ B. t. u. per square inch per hour required and Fig. 2 shows this could be met by designing for 160° at the register and a riser velocity of 600 F. p. m.

TABLE III

Heat Delivery B.T.U. per Hour Through 3 x 10 Riser At Various Register Temperatures and Air Velocities in Riser

F.P.M.	REGISTER TEMPERATURE 135°	140°	145°	150°	155°
400	5,600	6,000	6,400	6,800	7,100
425	5,900	6,400	6,800	7,100	7,700
450	6,300	6,700	7,100	7,700	8,100
475	6,700	7,100	7,500	7,900	8,600
500	7,000	7,500	7,900	8,600	9,100
525	7,300	7,900	8,300	8,800	9,400
550	7,700	8,100	8,800	9,400	10,000
575	8,100	8,600	9,600	9,700	10,300
600	8,300	9,100	9,700	10,000	10,700
625	8,800	9,400	10,000	10,700	11,100
650	9,100	9,700	10,300	11,100	11,500
675	9,400	10,000	10,700	11,500	12,000
700	9,700	10,300	11,100	12,000	12,500

Let's emphasize the fact that the values listed in Fig. 2 represent the values which are *preferred* by many experienced fan heating men, but that they *may* be exceeded if necessary. It is recommended, however, that unless you have had a reasonably broad experience in such work to guide you, it will be better to *limit* your designs of remodeled systems to these values unless you consult a competent, experienced engineer.

Since the sizes of wall stacks most commonly encountered are 3-in. by 10-in. and 3-in. by 12-in., Tables 2 and 3 will be convenient in determining the quantity of heat which these stacks will deliver for various temperature and velocity combinations.

Some Basic Principles of Humidification [Part 3]

By O. J. Kuenhold

Engineer, Monmouth Products Co., Cleveland, O.

Practically all homes have single thickness glass windows. Very few of their owners will go to the expense of installing double windows. Furthermore, it is not necessary to have double windows. Chart No. 5 shows that in weather from about 22 degrees and upward, the room humidity can be maintained from 30 per cent and upward without incurring excessive window moisture on single glass windows. The room humidity needs to be reduced below 30 per cent only during the few short periods of colder weather.

The harm to health and belongings which is done by low humidity occurs only upon long exposure to low humidity. The greatest benefits from humidifying come from the first ten per cent of increased humidity. Less gain in benefits result from further increase and very little is gained by increasing the humidity above 30 or 35 per cent while substantially nothing is gained by increasing it above 40 per cent. When room humidity is maintained upon a sliding scale—lower humidity in colder weather and higher humidity in more moderate weather—the home owner secures practically 100 per cent of the benefits.

Double windows are therefore not necessary for the maintenance of adequate humidity. Their principle advantage is in eliminating window vapor. Adequate humidity can be maintained with single windows by some sacrifice of window clarity; but with the room humidity controllable or automatically controlled upon a sliding scale to conform to window glass temperature changes, no excessive window wetness need be incurred. This is a fact important to the conditioned air heating industry because it means that the huge market represented by homes having the usual single windows is wide open and the right kind of humidifying equipment can do an adequate job of humidifying.

Referring now to Chart No. 5, the distance "v" from Curve N to Curve V indicates how much moisture must be added to raise the indoor humidity up to the window vapor point. In colder weather slightly less evaporation is needed to reach the window vapor point and if we supply evaporating equipment which can vaporize enough water per hour to raise the humidity from the natural humidity shown by Curve N up to 40 per cent during 35 degree weather then the increasing heat of the furnace during colder weather will easily be able to increase evaporation and maintain 40 per cent humidity in any colder weather, should this be desired.

During 35-degree weather, the indoor air at 70 degrees will contain about 23 grains of moisture per

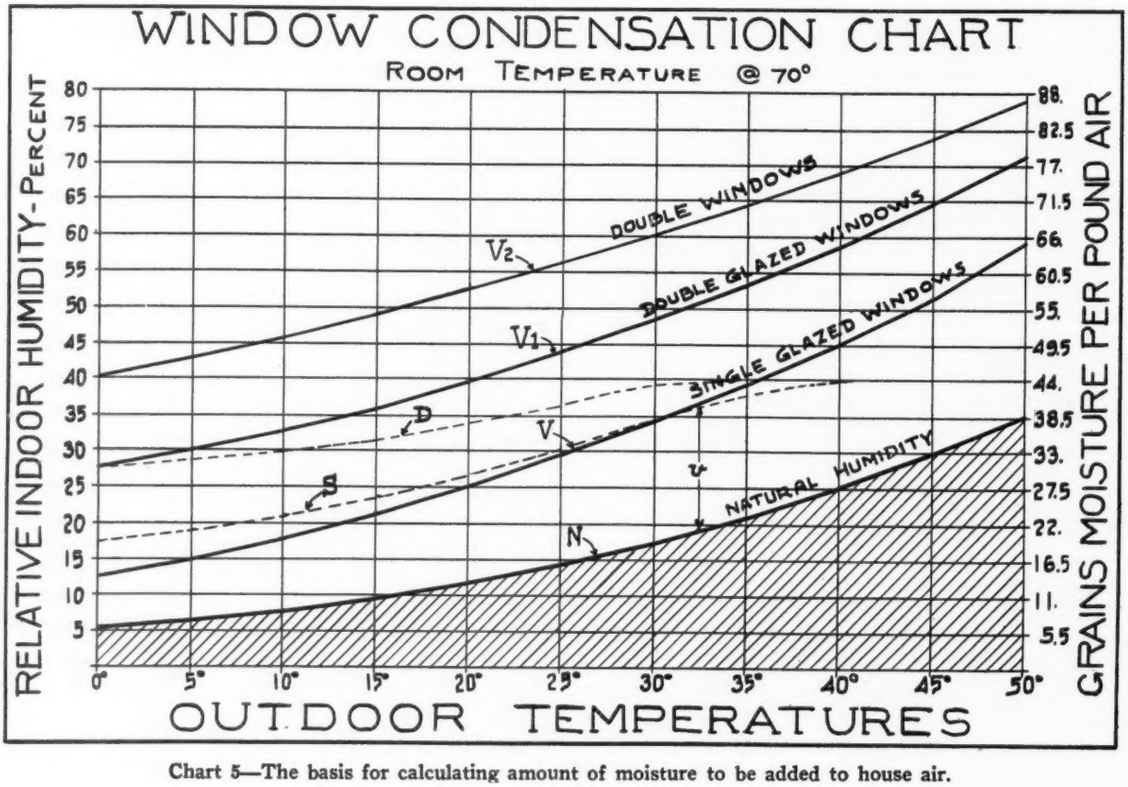


Chart 5—The basis for calculating amount of moisture to be added to house air.

pound if no moisture is added. If the humidity is raised to 40 per cent, the air will contain 44 grains per pound. The difference is 21 grains of moisture per pound of air, which is the amount of water that must be evaporated for every pound of outdoor air (13.5 cubic foot) that enters the house. This is equivalent to 1 quart per hour (6 gallons per day) for each 10,000 cubic feet of entering outdoor air per hour.

In other words, to find how many gallons of water must be evaporated **per day,** divide the volume of outdoor air which enters the home **per hour** by 10,000 and multiply by 6.

Size of Evaporating Equipment

Having determined the rate of evaporation per day which is necessary to maintain the desired room humidity, our next problem is to find what size of evaporating equipment is needed to supply the required evaporation.

The evaporating equipment may be a spray, an air washer or an evaporating pan. As an evaporating pan located in the bonnet of the furnace is the most popular method, this is the only one that will be considered here.

The evaporation from such a pan is proportional to the area of water surface exposed, but the rate of evaporation depends mainly upon the temperature of the water and the temperature of the air which circulates around the pan. Air velocity or turbulence has a minor influence and the influence of the relative humidity of the air coming into the furnace is still smaller. The last two may therefore be disregarded.

The water temperature is dependent upon the heat it receives by conduction, radiation and convection and this has considerable influence in increasing the rate of evaporation. We can however, assume that the water temperature is proportional to the temperature of the circulating air in the furnace bonnet and on that basis the evaporation per square foot of exposed water surface which can be expected will be as shown in the table.

TABLE 6—EVAPORATION FROM WATER PANS IN BONNET

Designed Register Temp. in 0° Weather	Gallons per day per square foot water surface during 35° weather	
	Grav. Circulation Gals.	Forced Circulation Gals.
200°	6.5	
190°	5.7	
180°	5.	
*175°	4.5	
170°	4.1	2.7
160°	3.4	2.3
150°	2.6	1.8
140°	1.9	1.3
130°		1.1

CONDITIONS ASSUMED: Evaporating pan in furnace bonnet. Rooms warmed to 70 degrees. Evaporation for gravity circulation is with or without thermo control. Evaporation for forced circulation is with thermo control and intermittent blower operation.

*175° register temperature is "Code" design gravity circulation.

The rates of evaporation given in Table 6 are based upon a combination of tests, calculations and practical experience and assume a well designed and located pan in the dome or bonnet of the furnace, not exposed to direct heat conduction from the furnace castings.

Note that the given evaporative rates are for the average bonnet temperatures prevailing during 35 degree weather. In the case of pans in furnaces having forced intermittent air circulation, the average bonnet temperature may vary to some extent in different installations according to the automatic blower control settings — temperature at which blower comes on and off, speed changes, etc. The evaporative rates given in the "Forced Circulation" column are however safe averages reflecting the best known data of today.

The evaporative rates are given for average bonnet temperatures prevailing during 35 degree weather because as weather gets colder, the furnace bonnet temperature, and therefore the rate of evaporation, will increase. We must, however, have ample evaporative capacity during milder winter weather and if we have sufficient evaporation for 35 degree weather we shall be sure of having ample evaporative capacity for all colder weather.

Evaporative Capacity

Study of the evaporation table (Table 6) will clearly show a number of very important facts. Note that in gravity heating plants designed for 175 degrees register discharge temperature in zero weather, the evaporation during 35 degree weather will be at the rate of about 4½ gallons per day for each square foot of water surface. If, in the same house and same size furnace, the leader areas are cut down so as to have a register temperature of 200 degrees, the rate of evaporation will be about 6½ gallons per square foot of water surface per day. On the other hand if the leader areas, for the same size of house and furnace, will be increased so that in zero weather the register discharge temperature will be 140 degrees, the evaporative rate will be only 1.9 gallons per square foot per day. This means that in one case the area of water surface provided must be 3.4 times as great as in the other case.

The volume of outdoor air per hour coming into one house may be 4 times as great as in another house requiring the same size furnace. If the first mentioned house should have its heating plant designed for 140 degrees register temperature and the house of small leakage should have its heating plant designed for 200 degree register temperature, then the required water surface area in one case would have to be almost 14 times as great as in the other

(Continued on page 58)

Control Methods for Domestic Conversion Gas Burners*

[Part 2]

By L. C. Price

Research Associate Professor of Mechanical Engineering, University of Arkansas

Various Control Methods

Six possible control methods were investigated. These will be listed now and discussed later, and, for the sake of brevity, they will be referred to by number, thus:

No. 1, Intermittent control of both gas and air; gas flow rate set for a full fire. This is the usual method of automatic control with burners of domestic size.

No. 2, Intermittent control of gas only, the gas flow rate being set for a full fire, and the air damper remaining fully open. This, also, is a frequent method of automatic control, less common and less economical than No. 1.

No. 3, Throttling of gas only while the air damper remains fully open. This is the usual method of hand control, in both large and small installations.

No. 4, Throttling of both gas and air, the air supply being adjusted for best conditions at all times by means of a damper at the intake. This method is often used for the automatic control of large installations, but proved impractical in domestic sizes.

No. 5, Intermittent control of both gas and air; gas flow rate set for a half fire and the air adjusted accordingly by means of the intake damper.

No. 6, Intermittent control of gas only; gas flow rate set for a half fire, and the air damper remaining open at the point which is optimum for the half fire.

With any given burner, the fuel consumption at full boiler load will be the same for all control methods. Consider now what happens when the load is reduced.

Typical curves of hourly fuel consumption versus boiler output for the various control methods are shown in Figure 1. The point C, at full boiler load and continuous burner operation with optimum air supply, is common to all control methods. A decrease in load causes a corresponding reduction in the demand for fuel.

The result, with No. 1 control method, is that the gas is cut off during a part of the time, and as the demand for heat continues to decrease, the length of the "off" periods increases. As this process continues, the point expressing the consumption-load relation drops along the line BC. If the load reduction were carried far enough, a hypothetical condition would finally be reached, represented by the point B, where the fuel consumption would be zero and the load would be negative; that is, the boiler would have to be kept hot by steam from an outside source. Both the gas valve and the air damper now remain closed.

The same thing happens when control is by the No. 2 method, except that more fuel is required to offset the cooling effect of air which is admitted to the combustion chamber by the open damper during the "off" periods. When the imaginary condition of zero fuel and negative load is reached, the damper remains open, and more steam is required to keep the boiler hot than when the damper was kept closed. This condition is represented by the point A, and the curve AC expresses the consumption-load relation for Control Method No. 2.

With throttling control, decreasing load causes throttling of the gas by control method No. 3, and throttling of both gas and air by No. 4. If the load were reduced past zero to the point where no fuel would be consumed, control method No. 3 would give a wide open air damper as did No. 2, and No. 4 would give a closed damper as did No. 1.

The resulting negative loads would again be represented by points A and B. Thus, under the imaginary condition of zero fuel supply and negative boiler load, the amount of negative load is a single value for Nos. 1 and 4, and another single value for Nos. 2 and 3.

It appears, therefore, that all four curves have a common upper point, that Nos. 1 and 4 have a common lower point, and that Nos. 2 and 3 have another

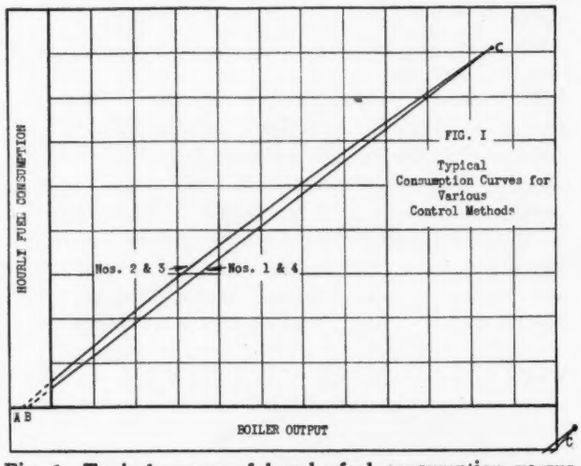


Fig. 1—Typical curves of hourly fuel consumption versus heater output for different control methods. A decrease in load causes a corresponding reduction in fuel demand.

common lower point. Having common upper and lower points, the two curves of each pair, (1 and 4) and (2 and 3), will coincide, provided both are straight lines or have some other common form. In all cases investigated this has been found actually true; test data for Nos. 1 and 4 form a single straight line, and Nos. 2 and 3 form a curve lying above* the line of Nos. 1 and 4, and having a slight concavity downward.

The obvious conclusion is that, from an economy standpoint, Control Methods Nos. 1 and 4 are preferable to Nos. 2 and 3, and that there is no choice between

*Published as Bulletin No. 12, Engineering Experiment Station, Univerity of Arkansas, Fayetteville, Arkansas.

*This is due to the cooling effect of air admitted through the wide-open damper.

1 and 4, or between 2 and 3. From a practical standpoint, however, No. 1 has the advantage over No. 4 for domestic heating plants, since, in the latter case. with light loads and throttling control, the adjustment of the air supply is extremely sensitive and the optimum setting requires considerable juggling to effect.

Consumption curves Nos. 1 and 4 will coincide only when the latter is a straight line. The upper end will rise above a straight line when burner and boiler are forced to a very high output. This point was investigated with one burner in a boiler, and the No. 4 curve rose above a straight line when the boiler output was forced above about 510 sq. ft. of radiation (2 per cent overload based on a rating of 500 sq. ft.). In every

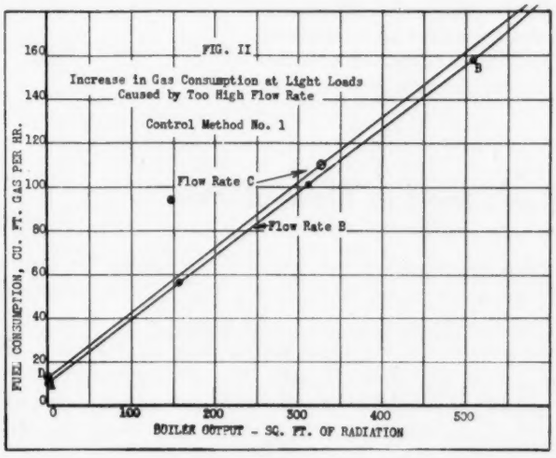


Fig. 2—Plotted data from an actual test showing increase in gas consumption under control 1 with an excess of gas used.

case, No. 1 consumption curve was found to be a straight line throughout its length. Therefore, if the gas flow setting for No. 1 control exceeds that at which No. 4 consumption curve leaves a straight line, No. 1 consumption line will be above No. 4 at light loads.

Figure 2 is a plot of actual test data which illustrates the point. The line ABC represents the consumption-load relation for Control Method No. 4. When the gas flow rate was set at the value represented by the point B, and the control method changed to No. 1, the fuel consumption at light loads was again on the line AB. On the other hand, when method No. 1 was used with a higher gas flow rate, represented by point C, the fuel consumption at light loads was greater than in the first case, and the consumption-load relation was represented by the line DC.

Best economy with No. 1 control will be realized when the gas flow setting is not greater than the critical value, B, just referred to. In the laboratory, it was found that the most satisfactory way to determine the maximum advisable gas flow rate for No. 1 control was to follow the No. 4 method, increasing the flow rate until the excess air requirement reached a minimum (indicated by maximum CO_2 in the stack gases). The gas flow rate established in this way was always found to be equal to or less than that at which No. 4 curve left a straight line. With this as a starting point, No. 1 control was as economical as No. 4, and is more practical for a plant of domestic size. With any given installation, the point can only be found by experiment.

In considering control method No. 5, it is evident that the upper point of the consumption curve will be on the No. 4 curve, since both are obtained by throttling both gas and air. With a reduction in load to the imaginary point of zero fuel and negative load, No. 5 control method gives a closed air damper, as do Nos. 1 and 4, so that we would expect the No. 5 consumption curve to coincide with Nos. 1 and 4, and the test data confirm this conclusion. This control method, therefore, cannot be expected to show any improvement in economy over No. 1, unless the gas flow setting for No. 1 is too high (see the preceding paragraph). Where a heating plant is overloaded in severe weather, the No. 5 method may prove more economical than No. 1, but the gas flow setting and air adjustment will have to be increased when hard driving is required.

On the basis of the foregoing, it is not to be expected that control method No. 6 will show as good economy as Nos. 1, 4, and 5, since it allows the air damper to remain partly open continuously. The damper opening is, however, always less than with methods Nos. 2 and 3, so that the operating economy with No. 6, while not quite so good as that of Nos. 1, 4, and 5, would still be an improvement over Nos. 2 and 3. Such proved to be the case in this investigation. The only virtue of the No. 6 method appears to be in its applicability to installations which have no air damper, but simply a hole through which air enters, or in cases where no provision has been made for attaching the damper to the gas valve so that both close together. In the former case, the air supply can be cut down to match a reduced fuel flow rate by partial stoppage of the hole, and in the latter case the same thing can be effected by partial closure of the damper. Method No. 6 is subject to the same limitation as No. 5, in that the flow rates of both gas and air must be increased in severe weather.

Description of Apparatus

A steam boiler was used in all the tests, since its output is easier to measure accurately than that of any other type of heating appliance. It was a three-section, round, coal-burning boiler having a grate 22 inches in diameter and said by the manufacturer to have a heating surface of 28.83 sq. ft. The manufacturer's rating of the boiler was 450-500 sq. ft. of steam radiation. The boiler was covered with the standard corrugated insulation furnished by the manufacturer, over which was a sheet iron jacket. The products of combustion discharged into the usual cast-iron smoke box, with a draft hood eight inches above. Height of the draft hood above the grate level was 4 feet, 9 inches.

The rate of evaporation was determined by weighing the feed water, while the steam was discharged to atmosphere. Water from the city mains was run into a tank on a scale, weighed, and then dumped into a feed tank below, from which a small motor-driven centrifugal pump, running continuously, delivered it to the boiler. A feed-water regulator between pump and boiler maintained a constant water level in the boiler at all times. A hook gauge in the lower tank allowed the water there to be brought to a set level at weighing time.

(*Continued on page* 56)

Forced Air Heating Facts From the Research Residence

By S. Konzo
Special Research Associate,
University of Illinois

In the January, 1936, article, the author presented a condensed table of pressure losses for the use of designers of forced-air heating systems. One item in the table was with reference to the pressure loss of forced-air registers. In this present article a more detailed explanation of registers and their pressure characteristics is presented. The author has drawn upon several sources of information for the data presented, and proper references have been made in each case.

Forced-Air Registers—Their Resistance to Flow of Air

Introduction

AIR cannot be forced to move from one place to another unless a pressure differential exists between the two places. Air cannot be squeezed through a restriction, turned at an angle, and projected into a room unless a pressure head of sufficient magnitude is available. In fact, the installer is constantly confronted with the necessity of providing sufficient pressure in that part of the duct system which comprises the register outlet.

In the case of a gravity warm-air system, the motive head available for moving the air is relatively small. As a consequence, the warm air registers for gravity installations must be relatively large and unrestricted. Also, on account of the small available pressure head, very little can be done in the way of deflecting and directing the flow of air. The commercial registers suitable for gravity installations are usually provided with large openings, which offer very little resistance to the flow of air, particularly with the range of velocities ordinarily used.

However, in the case of forced-air installations, the very fact that pressure is available for moving the air through the system at any desired velocity, has created a demand for registers that are more than mere open-

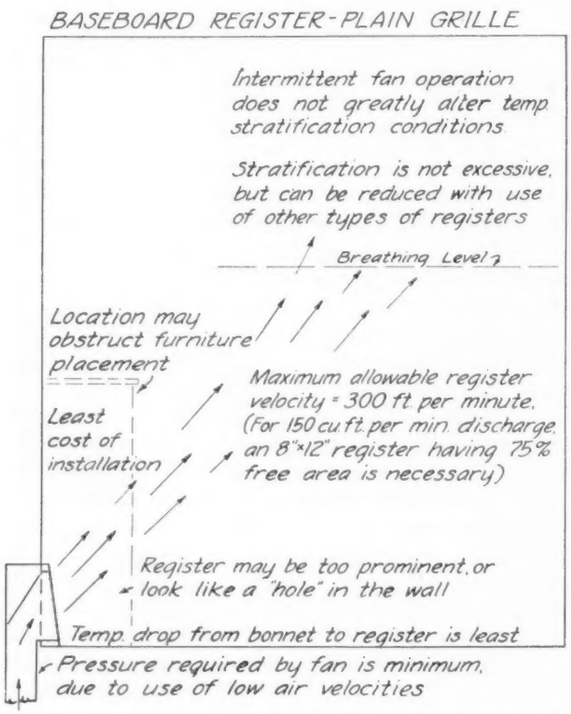

BASEBOARD REGISTER-PLAIN GRILLE
Intermittent fan operation does not greatly alter temp. stratification conditions
Stratification is not excessive, but can be reduced with use of other types of registers
Breathing Level
Location may obstruct furniture placement
Maximum allowable register velocity = 300 ft. per minute. (For 150 cu. ft. per min. discharge, an 8"×12" register having 75% free area is necessary)
Least cost of installation
Register may be too prominent, or look like a "hole" in the wall
Temp. drop from bonnet to register is least
Pressure required by fan is minimum, due to use of low air velocities

Fig. 1—Diagram showing characteristics of baseboard, plain grille register.

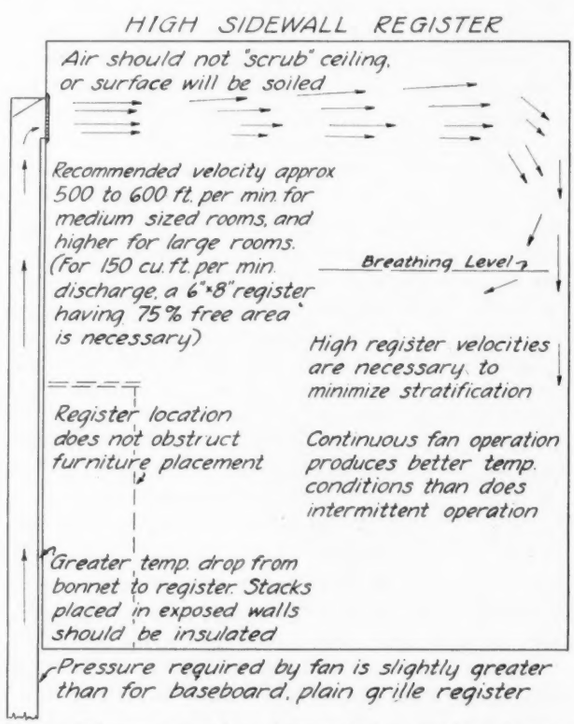

HIGH SIDEWALL REGISTER
Air should not "scrub" ceiling, or surface will be soiled
Recommended velocity approx 500 to 600 ft. per min. for medium sized rooms, and higher for large rooms. (For 150 cu. ft. per min. discharge, a 6"×8" register having 75% free area is necessary)
Breathing Level
High register velocities are necessary, to minimize stratification
Register location does not obstruct furniture placement
Continuous fan operation produces better temp. conditions than does intermittent operation
Greater temp. drop from bonnet to register. Stacks placed in exposed walls should be insulated
Pressure required by fan is slightly greater than for baseboard, plain grille register

Fig. 2—Diagram showing characteristics of high sidewall register.

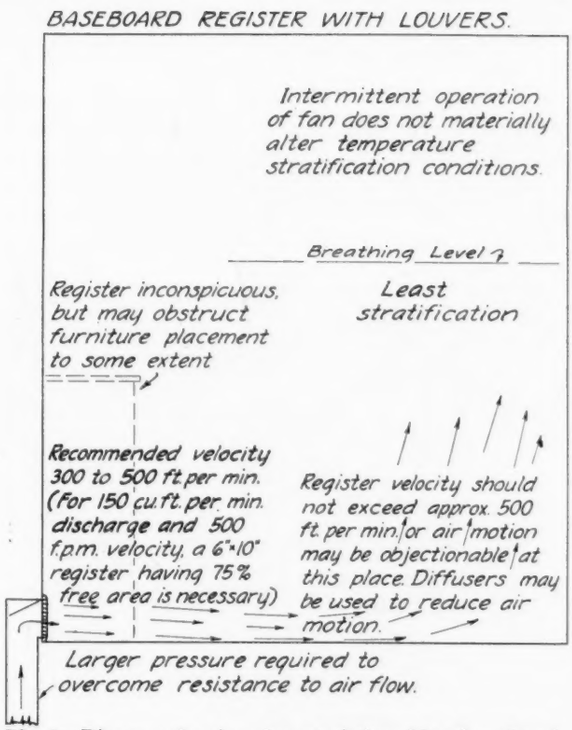

BASEBOARD REGISTER WITH LOUVERS.
Intermittent operation of fan does not materially alter temperature stratification conditions.
Breathing Level
Register inconspicuous, but may obstruct furniture placement to some extent
Least stratification
Recommended velocity 300 to 500 ft. per min. (For 150 cu. ft. per min. discharge and 500 f.p.m. velocity, a 6"×10" register having 75% free area is necessary)
Register velocity should not exceed approx. 500 ft. per min. or air motion may be objectionable at this place. Diffusers may be used to reduce air motion.
Larger pressure required to overcome resistance to air flow.

Fig. 3—Diagram showing characteristics of baseboard register with louvers.

ings in the walls. The home-owner, the heating man, and the architect have demanded many requirements that have been met by the manufacturers of such registers in a great many different ways. For instance, some of the requirements that have been imposed may be enumerated as follows:

a. Registers should be compact, of good appearance, and not too conspicuous.
b. Registers should be of such construction that they can be placed in the baseboard, in the sidewall, in the window stool, or in the ceiling. (See Figs. 1, 2 and 3.)
c. Registers should be capable of delivering air at a high velocity without creating air noise.
d. Registers should be capable of delivering the air either in a single core; in a fan spread; upwards; downwards; sidewise; or in many directions at the same time. (See Fig. 3.)

Each and every one of these demands of the register requires air pressure. It is not safe practice to ignore this pressure requirement since the magnitude of the pressure losses is not negligible. It is the purpose of this article to discuss: (A) the magnitude of the pressure losses; (B) the use of such pressure data; (C) the relationship between pressures and free area of opening; (D) the relation between pressures and air deflection; (E) the relation between pressures and air projection.

A. Magnitude of Pressure Losses

The values shown in Table 1 were reproduced from a previous article by the author (see January, 1936, issue) and show the magnitude of the pressure loss for a plain grille face, in which the air is not deflected from its natural course. The pressure losses are given for values of free area ranging from 50% to 80%, and for values of air velocity ranging from 200 feet per minute to 1,000 feet per minute.

TABLE I

Pressure Losses of Registers, in Inches of Water

Air Velocity Feet per minute	200	400	600	800	1000	Notes:
Free Area	Plain grille face, with no deflection of air					
50%	0.01	0.03	0.06	0.11	0.17	2.75 v.p.
60%	0.00	0.02	0.04	0.06	0.11	1.6 v.p.
70%	0.00	0.01	0.02	0.04	0.07	0.9 v.p.
80%	0.00	0.00	0.01	0.02	0.03	0.5 v.p.

Note:
Deflecting Type registers
For registers of the deflecting type, in which the air is deflected at an angle of 45 degrees from the direction of flow, use twice the pressure values shown in the table.

It may be noted from the values shown in the table that for air velocities less than 400 feet per minute, the pressure losses through the register are of the order of 0.03 in. or less. In the case of the usual, small forced-air systems in which the total pressure loss through the system is of the order of 0.25 in. to 0.30 in., the pressure loss through the register accounts for approximately 10% to 12% of the total value, or loss.

The pressure losses for register air velocities greater than 400 feet per minute may account for a sizeable proportion of the total loss in pressure, and hence should not be ignored. For instance, when registers are located on the high sidewall, as shown in Fig. 2, the minimum recommended register velocity is of the order of from 500 to 600 feet per minute. It may be noted from Table 1 that a register of the non-deflecting type having a free area percentage of 60%, when used with an air velocity of 600 feet per minute, has a pressure loss of 0.04 in. of water. Under the same conditions of velocity, a register of the deflecting type will offer a frictional resistance that is twice as great, or approximately 0.08 in. of water.

Under latter conditions the pressure loss through the register may account for as much as 25% of the total resistance imposed on the fan. The omission of a pressure loss of this magnitude may result in the selection of a fan that is too small for the heating installation.

Table 2 shows similar data for the conventional types of return grilles.

TABLE 2

Pressure Loss Through Inlet Grilles, in Inches of Water

Air Velocity, Feet per minute	200	400	600	800	1000	notes
Inlet Grille	0.002	0.010	0.022	0.040	0.063	Based on 1.0 v.p.

B. Use of Pressure Data

As stated in the January, 1936, article the values of pressure loss are additive; that is, the total loss in pressure of a forced-air system is equal to the sum of each and every resistance in the system between the inlet grill and the outlet warm air register. The usual procedure in determining the resistance against which the fan must deliver its air, is to add the individual

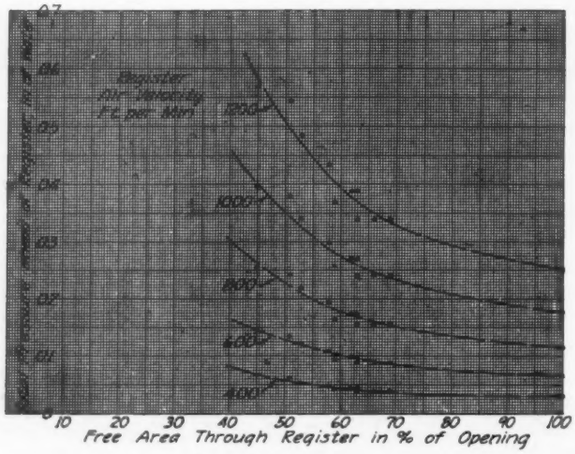
resistances in the following parts of the system:

1. Inlet grille—See Table 2.
2. Return duct
3. Air filters
4. Casing loss
5. Warm air duct
6. Warm air registers—See Table 1.

The sum of the resistances for items 1 to 6 is equivalent to the "static pressure" against which the fan is to deliver a given quantity of air.

C. Pressure Loss and Free Area

It may be noted in Table 1 that the loss in pressure through the register for any given register velocity is small when the "free-area" percentage is large. The



Curves showing relationship between free area of register and total pressure ahead of the register. Data from tests by Prof. G. L. Tuve, plotted by S. Konzo. Courtesy Independent Register Co.

"free-area" or "daylight" area in a register is the sum of all the areas within the face of the register frame that are not obstructed by bars, louvers, or frame. The relationship between the free area of registers and the pressure loss was determined from the curves shown in Fig. 4, which the author has plotted from data obtained by Prof. G. L. Tuve of Cleveland, Oho. The data were obtained from a test plant similar to that illustrated in the line diagram shown in Fig. 5.

It should be noted that the measurements on the gage show the value of "total pressure" existing ahead of the register in the plenum chamber. In this case the "total pressure" is equal to the sum of the following three items:

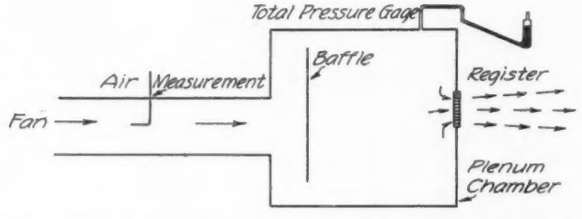


Fig. 5—Simplified line diagram showing arrangement for determining frictional resistance of registers. Note that "total pressure" gage does not give "frictional resistance" directly. See text.

1. Frictional resistance through the register.
2. Entrance loss to the opening in the plenum chamber,
3. Velocity pressure imparted to the air stream.

If no register were placed in the outlet hole of the plenum chamber, a pressure reading on the gage would be obtained, which would be equivalent to the pressure necessary to overcome the entry loss, and the velocity pressure imparted to the air stream. This

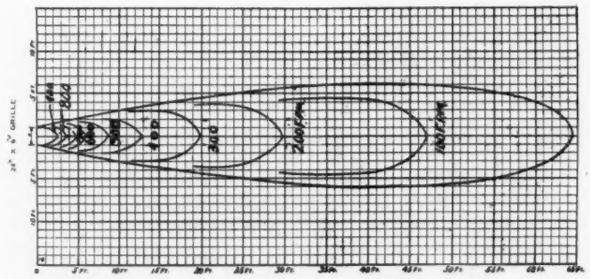


Fig. 6—Plan view of air path with bars vertically and straight—no deflection.

pressure reading which is obtained without the presence of a register (that is, when the free area is 100%) enabled one to determine the value of the frictional resistance through the register alone.

For example, for a register velocity of 1000 feet per minute, the "total pressure" loss through the open hole without any registers, (100% free area) was equivalent to 0.176 inches. (See Fig. 4.) This value included not only the entrance loss (item 2), but also included the velocity pressure (item 3). The value of 0.176 in. represents the sum of items 2 and 3 for a register velocity of 1000 feet per minute. In order to determine the "net frictional resistance" (item 1) of the register for a register velocity of 1000 feet per minute, the following simple correction must be applied to the "total pressure."

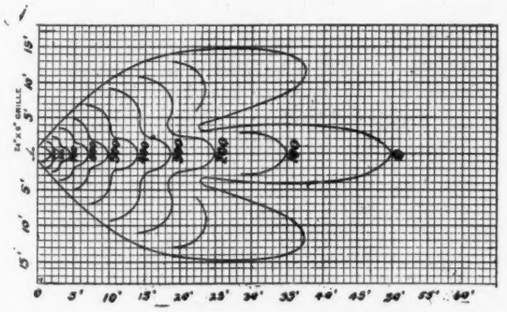


Fig. 7—Plan view of air path with bars vertically and three-way deflectors, 42°-0°-42°.

Example: Register velocity = 1000 ft. per min.
Free area = 50%.
Total pressure = 0.350 inches. From Fig. 4.
Sum of items 2 and 3 as above = 0.176 in.
Then, Item 1 = Total pressure — (item 2 + item 3).
or, Frictional resistance = 0.350 — 0.176 = 0.174 inches.
This value of 0.174 inches was tabulated in Table 1.

(*Continued on page* 52)

GET ON THE BANDWAGON

SUNBEAM

IS GOING PLACES

1 WITH NATIONAL ADVERTISING
2 WITH NEW PROMOTION
3 WITH NEW LOW PRICES
4 WITH A COMPLETE LINE

GOOD news!... People are asking for *practical Air Conditioning* in the homes they buy or build. Sunbeam dealers are in on the ground floor of a building boom with the finest sales program ever offered furnace men.

Up in front of Sunbeam's 1936 program is National Advertising—key directed to the logical market for Air Conditioning. Advertisements of dominant size are telling the advantages of Sunbeam Air Conditioning to home builders, home owners, building men, architects . . . *the choicest prospects* . . . in the publications that interest them most.

Tieing up with the advertising are sales and promotion aids that make this huge national program *your own local program.*

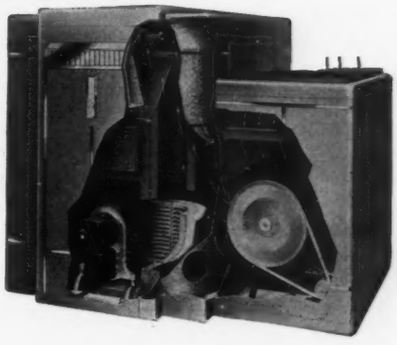
The Sunbeam line now includes a complete range of Sunbeam Air Conditioning Equipment and Sunbeam Warm Air Furnaces for every home—for every fuel—for every budget. New low prices will give you extra selling help. All the advantages of Sunbeam quality and workmanship are now available at a lower price than ever.

The Sunbeam franchise is a valuable one this year and every year. It will pay you to use the coupon . . . and get the complete details on Sunbeam Products and the Sunbeam selling program for 1936. Fill it in and mail it today.

SUNBEAM
AIR CONDITIONING
HEATS IN WINTER • COOLS IN SUMMER

THE FOX FURNACE COMPANY

ELYRIA, OHIO *Division of* AMERICAN RADIATOR & STANDARD SANITARY CORPORATION



SUNBEAM AIR CONDITIONING

Backed by more than 50 years of heating and air handling experience, Sunbeam Air Conditioning Units are outstanding in appearance and efficiency. In Winter, they supply clean, filtered, humidified warm air circulated automatically. In Summer, clean, cool air gently circulated to every room. Refrigeration and dehumidification can be added when desired. Models for oil, coal and gas, including one which comes equipped with oil burner.

SIX TYPES OF FURNACES

In addition to the cast iron heating plant shown here, there are two different lines of steel furnaces, one of them available in special oil burning models. Three different types of gas-fired furnaces complete the line of Sunbeam gravity heating plants—providing a gravity warm air furnace for every home—every fuel—every income.

THE FOX FURNACE CO., ELYRIA, OHIO

We are interested in a line of furnace and air conditioning equipment that will enable us to compete successfully for the larger volume of business that promises to be available this year. Please send complete details to—

*Name*_____

*Address*_____

*City and State*_____

(A-3)

All the air gets filtered..because every square inch of surface is UNIFORM!

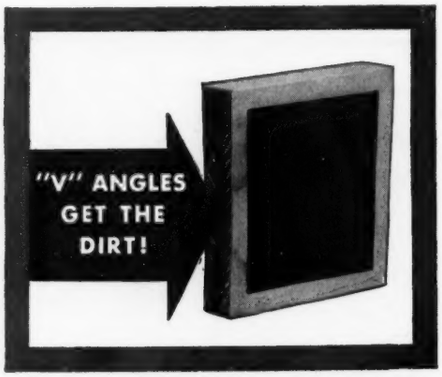
NOW! Engineered construction guarantees Uniformity!

● Engineered cellular passages and 90° change in direction of air flow give Arco Air Filters their uniformity and efficiency.

ACROSS the entire face of an Arco Filter every square inch is the same as every other square inch in efficiency and resistance. This uniformity is not due to chance, but to design, and the exclusive Cellular Construction makes it possible. In any one filter and in filters of the same type, the area, depth and angle of the passages are identical.

This cellular construction of Arco Filters offers many other advantages. Air is scrubbed clean by the 90° change in direction. The viscous, tacky surface holds dust without building up noticeable resistance to air flow. The dust catching efficiency actually improves as the filter is used.

Arco Air Filters are light, odorless and inexpensive. They won't drip oil at 180°. No dry dust can pass through into the air stream. They're engineered on scientific principles and thoroughly tested. There is a type for every air conditioning or ventilating job. Write today for the complete details.



INDUSTRIAL DIVISION
AMERICAN RADIATOR COMPANY
40 West 40th Street, New York, N. Y.
Division of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

ARCO AIR FILTERS

USED IN AMERICAN RADIATOR CONDITIONING SYSTEMS

Frost and Condensation on Windows [Part I]

With relative humidities of a higher percentage being recommended by physicians and guaranteed by installers, frost and condensation has become an acute problem. This series of articles explains why condensation appears and suggests some methods for lessening and preventing its accumulation.

By L. W. Leonhard[1]
and J. A. Grant[1]

MOISTURE on windows either in the form of condensation or frost may cause no great annoyance in many instances, however, in some cases this formation on the windows is not only annoying but very detrimental.

There are several reasons why the problem has grown more acute. The advantages of higher humidity of the air have resulted in the development and use of means for maintaining a higher moisture content than formerly. Better construction, at the window openings, has materially reduced the rate of exchange of air between the inside and outside of buildings, thus causing a building up of the moisture content of the inside air. Buildings nowadays have a much greater window area, and the amount of condensation is dependent upon the amount of window surface.

All of these factors have contributed to render the conditions more favorable for the deposition of moisture upon cold window surfaces. Not only has the amount or quantity of water thus deposited on the coldest days of the heating season been increased, but the formation of moisture occurs on more days of the season, because the favorable conditions enumerated above result in condensation at a higher outside temperature.

In this paper, these factors which influence the formation of frost and condensation on windows are discussed and some methods for lessening or preventing this formation are suggested.

Inside Temperature of Window Surfaces

In order to determine quantitative values for some of the principal factors that influence the inside temperatures of windows, some experiments were conducted during the winter of 1926-1927, in the Mechanical Engineering Laboratory of the University of Michigan with the cooperation of Prof. J. E. Emswiler[2] and W. C. Randall.[3]

A small window two panes wide and three high was placed in one end of a cold box of the laboratory refrigerating plant. Any desired low temperature could be maintained on the one side of the window with an ordinary room temperature on the other. Small thermocouples, flattened out very thin, were glued to the glass or other surface to be examined, whereby the temperature of those surfaces could be ascertained. A variable speed fan was located in the box, so that when desired, the cold air could be blown over the surfaces of the window, thus simulating wind conditions. The humidity of the air on the warm side could be varied by releasing steam into the room.

The objective of the tests was to determine the ratio of the difference between the temperatures of the inside surface of the glass, or other surface examined, and that of the cold air, to the difference between the temperatures of the warm and cold air. This ratio or factor may be expressed mathematically as follows:

$$f = \frac{\text{inside surface temperature} - \text{cold air temperature}}{\text{warm air temperature} - \text{cold air temperature}}$$

Thus, if the temperature of the warm air is 70 deg., the temperature of the cold air 10 deg., and that of the inside surface 30 deg., then

$$f = \frac{30 - 10}{70 - 10} = \frac{20}{60} = 0.33$$

The values of this factor, or ratio, defined previously and determined by the experiments are about as shown in Table 1.

TABLE 1

Item	Material	Conditions	Value of f
1.	Single Glass — ¼-in. Plate	No Wind	0.50
2.	Single Glass — ¼-in. Plate	With Wind	0.25
3.	⅛-in. Double Glass with ⅛-in. Air Space	With Wind	0.48
4.	⅛-in. Double Glass in Contact	With Wind	0.35

In the table, values for the factor f are given for the conditions of *No Wind* and *With Wind*. *No Wind* means that the fan on the cold side of the window was not in operation.

As is to be expected, winds or air velocities of dif-

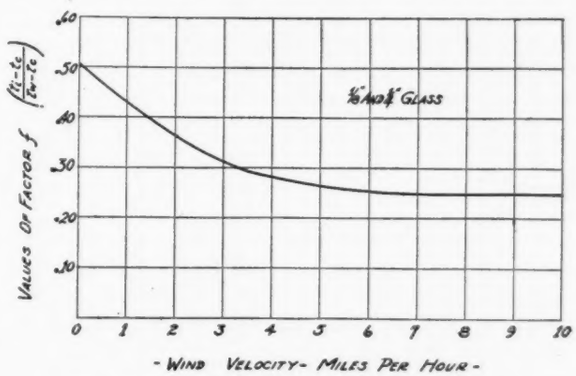
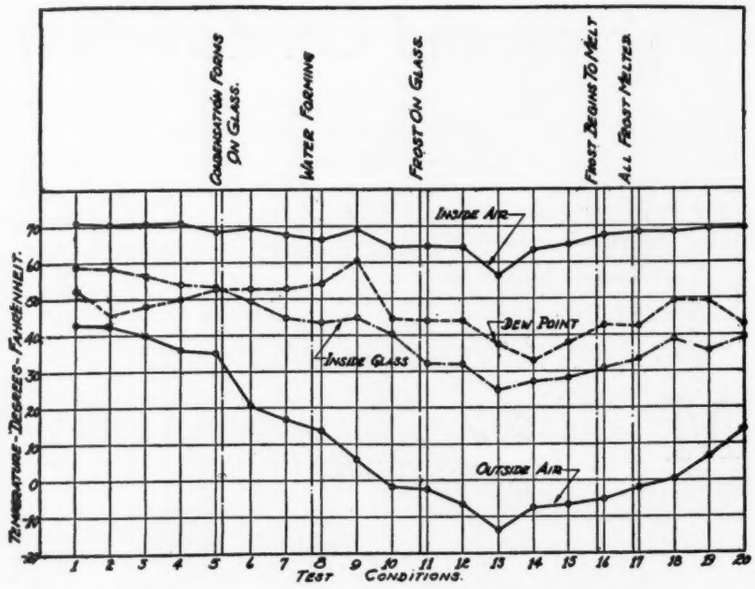


Fig. 1—Relation of factor "f" to wind velocity.

1. *Research Engineer, Detroit Steel Products Co., Detroit Michigan.*
2. *Professor of Mechanical Engineering, Universty of Michigan.*
3. *Chief Engineer, Detroit Steel Products Company, Detroit, Michigan.*

Fig. 2

Right—Chart showing temperature relations for condition of "no wind." Attention is called to the interesting fact that with "no wind" the glass temperature follows closely the rise and fall of outside temperature, but is mostly about half way between outside air and inside air temperatures.



◆

ferent magnitudes will produce different temperatures on the inside surfaces of the window. However, it was found that whereas, a small wind velocity caused a rapid reduction of the inside surface temperatures, the rate of decrease did not keep pace with increase of wind velocity, and at about 8 mi. per hour or more, there was but little further effect produced. The relations between wind velocity and the ratio, or factor, *f*, are shown in Fig. 1.

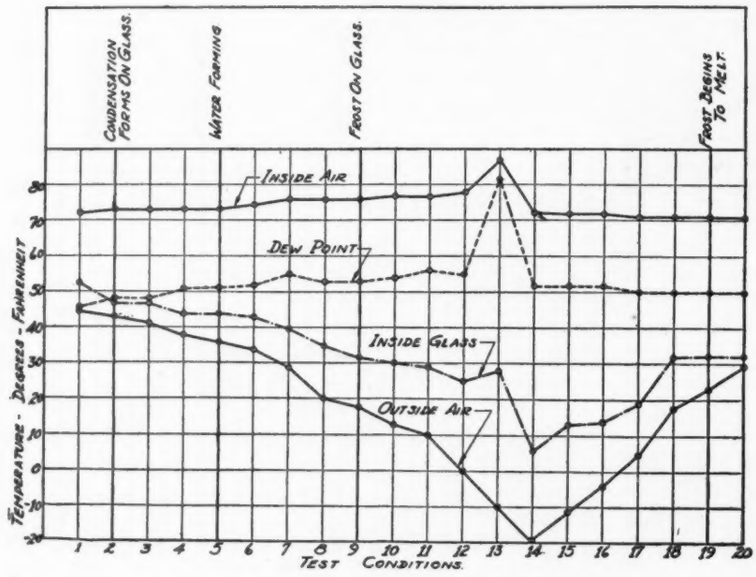


Fig. 3

Left—Chart showing the effect of wind on glass temperature. Compare with Fig. 2 and see how wind effect tends to drop glass temperature closer to outside air temperature. This means that windows exposed to wind will show frost and condensation quicker than will windows with "no wind."

◆

For no wind, the temperature of the inside surface of the glass is just about half way between the temperature of the outside cold air and that of the inside warm air. For a moderately high wind velocity, the inside glass temperature is only about one-quarter way between the two air temperatures. Thus, if the cold air is at 10 deg. and the warm air at 70 deg., the inside temperature of the glass for no wind is $10 + \frac{1}{2}(70 - 10) = 40$ deg. F., and with a wind of 8 or 10 miles per hour, the inside temperature of the glass is only $10 + \frac{1}{4}(70 - 10) = 25$ deg.

It is, therefore, seen that the wind is a very strong contributing factor in the formation of frost and condensation. This statement is borne out by the observed fact that frost and condensation appear first and are heaviest on those windows that are located on the windward or exposed side of a structure.

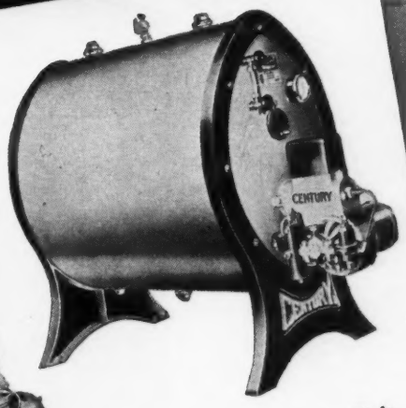
The curves of Figs. 2 and 3 show temperature relations between inside and outside air, dew point of inside air, and the inside surface temperature of the glass for numerous temperature conditions with and without wind action upon the outside surface. It should be noted that the horizontal scale does not represent equal time intervals, but merely indicates test conditions. These curves have been plotted from actual test data and show how closely the temperatures registered by the thermocouples agreed with the observed condition of the glass surface; for example, when the inside glass temperature became equal to or lower than the dew-point temperature of the inside air, as registered by the thermocouple reading, moisture was observed to be deposited upon the surface. The same was true for other observed conditions indicated by the vertical lines intersecting the curves. Fig. 2 also shows how the inside surface temperature of the glass for the *No Wind* condition is practically midway between the inside and outside air temperatures, but for the condition of wind action upon the outside surface, Fig. 3, shows the inside glass temperature to be much closer to that of the outside air, approximately three-fourths of the distance from the inside air temperature curve to that of the outside air.

[To be continued]

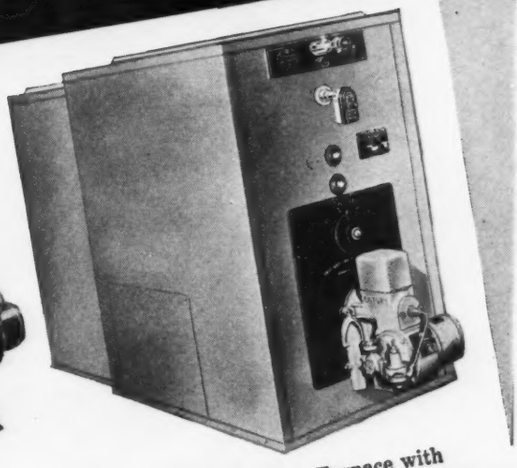
century SETS THE PACE

BIGGEST SALES IN HISTORY

Hot Water Heater



Boiler Burner Unit



Warm Air Furnace with Air Conditioning

Sell a Complete Line of Heating and Air Conditioning Equipment Under One Famous Name

Now Century offers wide awake dealers a complete line of automatic heating equipment. Make every prospect a sale by having just the right unit to fit each particular requirement whether a conversion oil burner, a Century Boiler Burner Unit, or a complete hot air and air conditioning job. The New Century Warm Air Furnace Unit brings all the advantages of Century Automatic oil heat plus winter air-conditioning. Many revolutionary and exclusive new features.

The Century boiler burner unit comes in four different sizes, to give you as much radiation as may be required. Then, too, there is the new Century domestic hot water heater . . . 200 gallons an hour at an 80 degree rise on less than 1½ gallons of cheap fuel oil. An ideal unit for apartments and multiple dwellings.

All Century units are fired by the famous quiet Model U oil burner with Floating Flame. Factory tested and sold on a positive guarantee. Join the leader. Write today for our special new dealer offer in your territory before it is snapped up.

Write Today for SPECIAL NEW DEALER OFFER Free Literature

Century Engineering Corp.

CEDAR RAPIDS, IOWA

Conversion Oil Burners . . . Boiler Burners . . . Warm Air Furnace Units . . . Water Heaters . . . Humidifiers . . . Air Conditioning

TRAPS AND HOLDS DUST

Dust has a slim chance to run the gauntlet of the Wilson Spider-Web Air Filter.

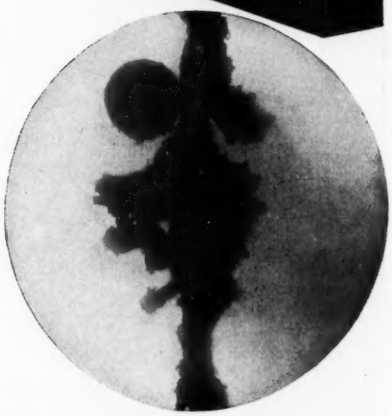
Hair is Nature's filter . . . an ideal holder of oil. The filtering material in Wilson Spider-Web is Keratin . . . animal hair . . . sterilized and treated with adhesive. Keratin compressed instantly expands like a sponge when released. That's why Keratin in Wilson Spider-Web constantly fighting to expand presses outward against the sides of the container, leaves no unguarded air passages and presents the maximum amount of impingement surface to trap and hold the dust particles in the air.

Progressive construction allows easy air entrance into the first loose layer with greater dust-holding capacity in the second denser oil-carrying layer.

Wilson Spider-Web Air Filters last longer than other filters and banish forever the disagreeable job of cleaning filters.* For a new Spider-Web costs less than the time, labor and materials used in cleaning other types of filters. Investigate.

**The dust-catching efficiency and dust-holding capacity of Wilson Spider-Web may be prolonged by tapping out the dust occasionally.*

WILSON
Spider-Web
AIR FILTER
TRAPS AND HOLDS DUST



A single Keratin fiber (magnified) removed at random from a filter in use. Note the dust clinging to adhesive in hair.

WILSON & CO. *Hair Division,* **4100 S. ASHLAND AVE., CHICAGO, ILL.**

Heat Loss Calculations For Space Heating*

By A. P. Kratz
Research Professor of Mechanical Engineering, University of Illinois

A RATIONAL method for estimating the heating requirements for a building must necessarily be based on a calculation of the heat losses from the building, since it is obvious that if a temperature higher than that of the outdoors is to be maintained in the various rooms, the heating system must supply an amount of heat that is just sufficient to offset the heat that is lost to the outside air.

A number of rules have been proposed for the purpose of simplifying or standardizing these calculations, but such rules are based on the assumption of certain typical constructions and average weather conditions, and apply only to cases that do not deviate materially from constructions and conditions assumed.

Complex Wall Construction

The increasing use of more complex wall constructions, particularly those arising from the use of the various forms of heat insulating materials, has further narrowed the field of application of these approximate rules, and made the use of a more flexible method imperative. The application of the exact method for calculating the heat losses is not appreciably more tedious than that of some of the approximate rules, since the coefficients for a large number of standard types of walls are available. On the other hand, an understanding of the fundamental principles of heat flow, and the method of computing the wall coefficients, is desirable in order to permit the calculation of coefficients for unusual types of walls, as well as to check those available in various publications.

The heat losses from a building may be considered under two heads, (1) heat transmission through walls, floors, ceilings, and windows, (2) infiltration of cold air into the building through cracks around doors and windows.

Whenever a difference in temperature exists between the air on the two sides of a structural material, such as a wall, a transfer of heat takes place which can be expressed in an equation of the general form

$$H = A\,U\,(t_i - t_o) \qquad (1)$$

in which H = heat transmitted in B.t.u. per hour, A = net area of wall in sq. ft., t_i = temperature of air in the room in deg. F., t_o = temperature of air outdoors in deg. F., and U = the overall heat transmission coefficient, or the heat transmitted per sq. ft. of surface per deg. F. in temperature from air to air, per hour.

*Address delivered at the Short Course in Coal Utilization, June 11, 12, 13, 1935, at Urbana, Ill.

Air Infiltration Losses

Air infiltration losses are those resulting from the displacement of heated air in a building by unheated air from outdoors. The wind causes a pressure to be exerted on one or two sides of the structure, and, as a result, air comes into the building on the windward side through cracks around doors and windows or through porous construction, and a similar quantity of air leaves on the leeward side.

The loss due to air infiltration can be expressed in the same general form as equation (1).

$$H_I = L\,I\,(t_i - t_o) \qquad (2)$$

in which H_I = heat lost in B.t.u. per hour, L = number of linear feet of crack around window sash and doors, t_i = temperature of air indoors in deg. F., t_o = temperature of air outdoors in deg. F., and I = the infiltration coefficient, or the heat lost per linear foot of crack per deg. F. difference in temperature, per hour.

By using the proper values of U, equation (1) may be applied to walls, floors, ceilings, doors, and windows. These values of U may be obtained for practically all standard types of construction by consulting the various handbooks and textbooks on heating and ventilation, such as the American Society of Heating and Ventilating Engineers' Guide, and no attempt will be made to list them here.

Values for I are not so commonly listed. They are dependent on wind velocity. For an average wind velocity of 13 to 15 miles per hour, 0.71 may be used for good window construction, assuming about 1/32 inch cracks, 2.0 for poor construction, and 0.40 for weather stripped windows. In applying formula (2), for a room with windows in two exposed sides, it is customary to use the side having the maximum length of crack, and for a room with more than two sides exposed to use one-half the total.

The inside temperature to be used in both formulas (1) and (2) depends on the class of building and the character of the occupants. For residences, 70 deg. F. for the living rooms and 85 deg. F. for bathrooms seem to be standard practice. The outside temperature to be used depends on the locality. Practice varies in this respect, but a rule that is in general use is to choose a temperature 15 deg. F. higher than the minimum shown by the weather reports for the given locality for the past ten years. This, of course, applies only to walls that are exposed to the weather. In the case of a wall that is exposed to an unheated space, similar to an attic or a cold basement, t_o, becomes the temperature in the cold space.

Inside Temperatures

For average construction, t_o, is approximately the mean between the temperature of the air in the heated portion of the building and the air outdoors. With well insulated walls or ceilings, however, the actual temperature in the unheated space may be materially lower than this mean.

Some of the published values of the overall heat transmission coefficient, U, have been determined by direct experiment, but most of the values for complex walls have been built up by calculation. In order to calculate this, some understanding of the laws of heat transfer is necessary. The most simple form of heat transfer occurs by conduction. In this case, the heat is communicated by direct contact from one layer of particles in the material to the next layer, and a more or less uniform drop in temperature occurs from one surface of the material to the other surface. This form of heat transfer always takes place in the solid portion of the wall. At the two surfaces of the wall, the transfer takes place both in convection and by radiation.

Convection occurs in a fluid medium, such as air. In this case, the heated portions of the air tend to circulate and come into contact with the colder wall surfaces, and to impart the heat to the surfaces by direct contact, or in case the surfaces are the warmer, the air receives its heat by direct contact and circulation. Radiation takes place when warm surfaces are brought near, but not in contact with, colder ones. It is transmitted through the air in the intervening space, in a manner similar to the transmission of light, and does not heat the air itself to any appreciable extent.

(Continued on page 48)

—71—

Examples in the Calculation of Heat Transmission of Various Constructions

I

Outside $f_o = 6.0$ — Inside $f_i = 1.65$

12" Brick wall $K = 5.00$

$$U = \frac{1}{\frac{1}{6.0} + \frac{12}{5.0} + \frac{1}{1.65}} = 0.315.$$

II

Outside $f_o = 6.0$ — Inside $f_i = 1.65$

12" Brick wall $K = 5.00$

½" Cement Mortar $K = 12.0$

2" Corkboard, $K = 0.30$

½" Gypsum Plaster, $K = 3.30$

$$U = \frac{1}{\frac{1}{6.0} + \frac{12}{5.0} + \frac{0.5}{12.0} + \frac{2}{0.3} + \frac{0.5}{3.3} + \frac{1}{1.65}} = 0.100.$$

III

Still air both sides $f_i = 1.65$

½" Gypsum Plaster $K = 3.3$

Air Space, $C = 1.10$

½" Fiber Insulation (Board form) $K = 0.33$

$$U = \frac{1}{\frac{2}{1.65} + \frac{1.0}{3.3} + \frac{1.0}{0.33} + \frac{1}{1.10}} = 0.183.$$

IV

Outside $f_o = 6.0$ — Inside $f_i = 1.65$

Clapboards, $K = 0.8$, Average thickness assumed $\frac{5}{8}$"

1" Sheathing, $K = 0.8$, Actual thickness $\frac{25}{32}$"

Air space, $C = 1.10$

Bldg. Paper, $C = 4.02$

Lath & Lime plaster $C = 2.50$

$$U = \frac{1}{\frac{1}{6.0} + \frac{1.406}{0.8} + \frac{1}{1.10} + \frac{1}{2.50} + \frac{1}{4.02} + \frac{1}{1.65}} = 0.244$$

V

Outside $f_o = 6.0$ — Inside $f_i = 1.65$

12" Brick Wall, $K = 5.0$

2" Hollow Tile with ½" Mortar & ½" Plaster $C = 1.00$

$$U = \frac{1}{\frac{1}{6.0} + \frac{12}{5} + \frac{1}{1} + \frac{1}{1.65}} = 0.240.$$

VI

Still air above & below $f_i = 1.65$

1" Flooring, Thickness = 0.78" $K = 0.8$

Joist — Air Space, $C = 1.10$

½" Plaster on Wood Lath $C = 2.50$

$$U = \frac{1}{\frac{2}{1.65} + \frac{0.78}{0.8} + \frac{1}{1.10} + \frac{1}{2.50}} = 0.286$$

U = Overall coefficient of heat transmission, B.t.u. per sq. ft per hr. per deg. diff in temp.
K = Thermal conductivity, B.t.u per sq. ft per hr. per deg diff per inch of material.
C = Thermal conductance, B.t.u per sq. ft per hr. per deg diff for thickness stated

f_o = Surface coefficient for still air.
f_o = Surface coefficient for 15 m.p.hr. velocity

} B.t.u. per sq. ft per hour per degree difference between surface and air.

Fig. 2

Be Sure You See

THE YORK OIL BURNER EXHIBIT

Booths 116L-118L at the Oil Burner Show at Detroit

Don't Miss

YOUR GOLDEN OPPORTUNITY

with the York Line of Oil Burners and Furnaces

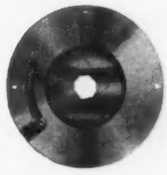
OIL BURNERS

The now famous YORK Model T conversion burner with the famous Iris shutter Control—in three sizes up to 9000 square feet of steam capacity.

YORK horizontal rotary burners for #5 and #6 oil up to 225 h. p. capacity —automatic or manual control—with or without pre-heating.

YORK industrial burners . . . for any and every use . . . high or low pressure . . . manual or automatic . . . steam or mechanical atomization . . . capacities up to 1500 h. p. . . . to burn the heaviest grades of oil.

The new Association seal —the mark of experience . . . quality . . . responsibility. You cannot afford to buy a burner without this seal of approval.



The now famous YORK Iris Shutter—the only method in the world for accurately controlling a CONSTANT supply of air.

OIL BURNING FURNACES AND BOILERS

YORK STEEL GRAVITY WARM AIR FURNACE IN TWO SIZES.

YORK STEEL FORCED WARM AIR FURNACE, WITH WINTER AIR CONDITIONING IN TWO SIZES.

YORK low pressure cast iron burner-boiler unit for inexpensive homes.

YORK low pressure all steel vertical tubular burner-boiler units for small commercial establishments in four sizes up to 1500 square feet of steam capacity.

YORK low pressure all steel horizontal tubular burner-boiler units for the better class homes, in five sizes up to 2000 square feet of steam capacity.

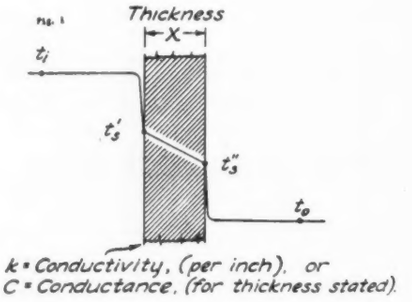
YORK high pressure burner-boiler units, all steel vertical tubular, in sizes from three to twenty horse power.

YORK OIL BURNER CO., Inc. - - YORK, PA.

Industrial Burners Since 1897 **Domestic Burners Since 1919**

Heat Transfer

When heat is transmitted through a building wall all three methods of heat transfer take place. The heat is first transferred to the inside surface by radiation from the warm bodies, and by convection from the warm air in the room. The resistance to the flow of heat in this way at the surface is very great, and a comparatively large drop in temperature occurs between the air in the room and the inside surface of the wall as shown in the diagram in Fig. 1. The heat that reaches the inside surface is then carried to the outside surface by conduction, and is accompanied by a comparatively small drop in temperature through the material. (See Fig. 1.)



TEMPERATURE GRADIENT THROUGH WALL SECTION

The better the material in the wall is as a heat insulator, the greater the drop in temperature becomes. At the outside surface the transfer again occurs by radiation and convection, and is accompanied by a comparatively large drop in temperature between the surface and the air. Thus it may be seen that the heat transfer through a simple wall may be broken up into two surface resistances and an internal resistance.

The surface resistance is affected by air movement and the temperature of the bodies near the wall. It is difficult to separate the effects of radiation and convection on the surface, but the combined effect at the inside surface may be expressed by the equation:

$$H = A f_i (t_i - t'_s) \qquad (3)$$

in which H = the heat transferred through the surface in B.t.u. per hour, A = surface area in sq. ft., t_i = temperature of the inside air in deg. F., t'_s = temperature of the inside surface in deg. F. and f_i = the surface coefficient for still air, or the B.t.u. per sq. ft. per hour per deg. F. difference in temperature between the air and the surface. In the case of the outside surface, equation (3) should be written

$$H = A f_o (t''_s - t_o) \qquad (4)$$

in which t''_s = temperature of outside surface in deg. F., t_o = temperature of the outdoor air in deg.

America's LOWEST PRICED
*FURNACE BLOWER
*not a fan

A COMPLETE BLOWER . . . not a fan! A centrifugal type blower complete with Furnacestat, motor, filters, blower cabinet, drive, blower and two full size access doors.

BEAUTY . . . Streamlined—a radical design improvement over the conventional "box type." Attractive Morocco baked enamel finish and chromium trim.

MECHANICAL PERFECTION . . . the result of extensive laboratory tests. A unit of proven merit . . . tested in thousands of homes and mercantile buildings over a period of years.

EASY TO INSTALL . . . only 27½ inches wide—will go through any door. Two full size access doors, one on each side for removing filters and placing complete assembly. Motor and drive assembly may be mounted on the most convenient side on the job in less than five minutes.

Write for complete information.

BRANCHES

DETROIT
Earl A. Newville
5716 Tuxedo Avenue

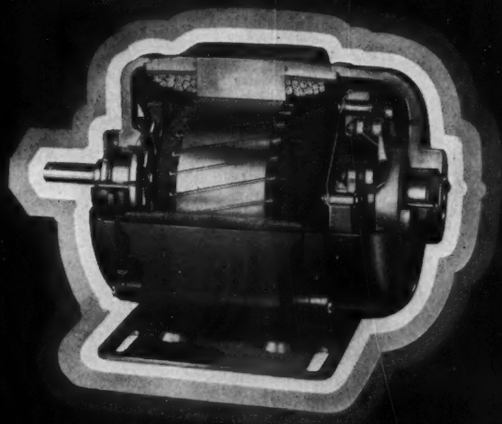
Boston
Widger Miller Corp.
614 Memorial Dr.

Pacific Coast
L. W. Swigert
1912—21st Ave. N.
Seattle, Wash.

Model 601 $56.50 Complete

LAU HEATING SERVICE, Inc. DAYTON, OHIO

THE MORE YOU KNOW *about* MOTORS...



...the MORE you'll appreciate BALDOR'S advanced designing and precision engineering

A close up of a Baldor Motor reveals such quality features as . . . liberally designed vital working parts . . . a larger proportion of motor weight is ACTIVE MATERIAL . . . oversize bearings and shafts of highest grade material.

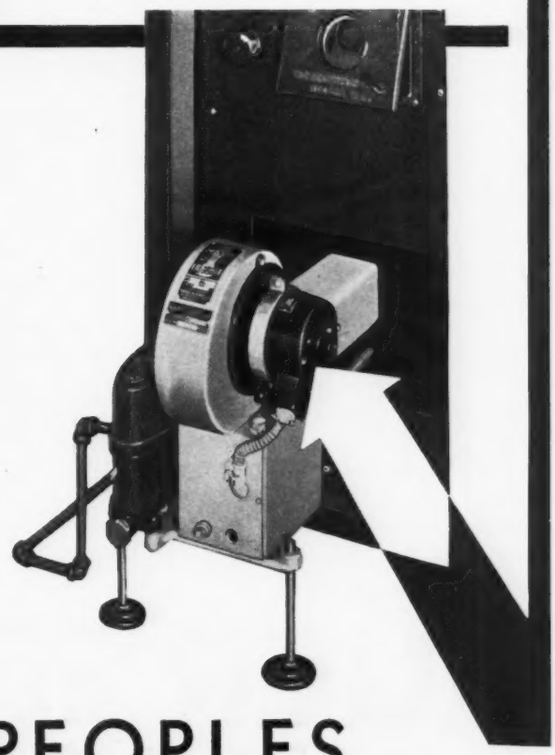
Rotors and armatures are dynamically balanced . . . indestructible Polyphase rotors and sine wave Repulsion Induction stator windings are among the many advancements originated and developed by Baldor.

The Baldor guarantee is definite assurance of performance—not a mere promise of free repairs and replacements.

BALDOR ELECTRIC COMPANY
4358 Duncan Ave., St. Louis, Mo.

BALDOR
A BETTER MOTOR

FOUND
An Ideal Oil Burner for Forced Air Heating and Winter Air Conditioning Systems



PEOPLES

is the name of the perfect oil burner found after years of testing and experimenting to be THE OIL BURNER for forced air and winter air conditioning. It has 8 features which make it the one burner for such installations:

No. 1. It avoids sudden changes in firebox.

No. 2. It is self contained.

No. 3. It can fire as low as ¾ gallons of oil per hour efficiently.

TODAY
WRITE FOR COMPLETE DETAILS

No. 4. It is simple to install.

No. 5. It is low in cost.

No. 6. It is quiet.

No. 7. It needs little if any service.

No. 8. It has no gadgets.

PEOPLES OIL BURNER CO.
466-A W. SUPERIOR ST. CHICAGO

F. and f_o = the outside surface coefficient. The value of f_i for still air varies somewhat, but a value of 1.65 can be used for most building construction. The value of f_o or outside surfaces depends on the wind velocity, and varies from 4.1 for wind velocity of 5 miles per hour, to 7.1 for a wind velocity of 20 miles per hour. The value of 6.0 may be used for an average at a wind velocity of about 15 miles per hour.

Conduction

The heat transmitted by conduction through the solid material in the wall may be expressed by the equation:

$$H = A \frac{k}{x} (t'_s - t''_s) \qquad (5)$$

in which H = the heat transmitted by conduction in B.t.u. per hour, A = surface area in sq. ft., x = thickness of the layer of material in inches, t'_s = temperature of the surface on the high temperature side in deg. F., t''_s = temperature of the surface on the low temperature side in deg. F., and k = the coefficient of conductivity, or the heat transmitted per sq. ft. per deg. difference in temperature from surface to surface per hr. per inch in thickness.

In the case of some complex materials and air spaces the conductivity, k, for one inch of thickness is to a certain extent a fictitious value, and handbooks give the conductance, c, or the B.t.u. transmitted per sq. ft. per hr. per degree difference in temperature from surface to surface for the thickness as stated. In this case the term c is used instead of $\frac{k}{x}$ in equation (5). Tables of coefficients of conductivities and conductances may be found in standard handbooks and textbooks, and will not be given here.

By combining equations (1), (3), (4) and (5) a general solution may be obtained for the overall coefficient of heat transmission, U. This takes the form:

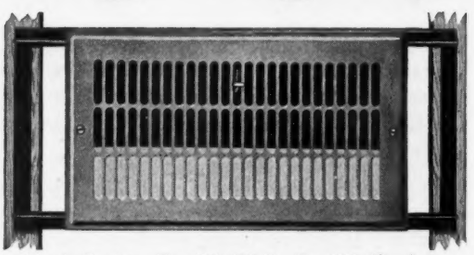
$$U = \frac{1}{\frac{1}{f_i} + \frac{1}{f_o} + \frac{x_1}{k_1} + \frac{x_2}{k_2} + \ldots\ldots + \frac{1}{c_1} + \frac{1}{c_2} + \ldots\ldots} \qquad (6)$$

in which U = overall heat transmission coefficient, from air on one side of the wall to air on the other side, f_i and f_o = surface coefficients for the inside and outside surfaces involved; x_1, x_2, etc. = the thickness of the individual layers of solid materials forming the wall, in inches; k_1, k_2, etc. = the individual coefficients of conductivity for the different materials corresponding to x_1, x_2, etc.; and c_1, c_2, etc. = the individual conductances for air spaces and for materials for which conductances are given for the thickness stated instead of per inch.

AUER REGISTERS . . . Keep Pace with Air Conditioning Progress

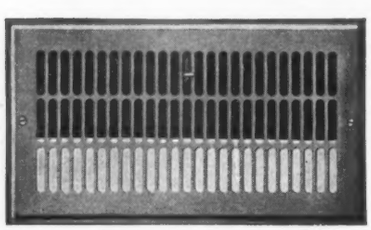
Auer Stamped Steel Registers—the famous CLASSIC Grille and the more conventional faces—go hand in hand with good air conditioning practice everywhere. Auer Registers are preferred not only because of distinctive design, but also for ease of installation. Valves are perfected both for effortless operation and positive stability when set. There is an Auer type for every air conditioning purpose, and for any interior decorative scheme.

THE AUER REGISTER COMPANY
3608 Payne Ave., Cleveland, Ohio

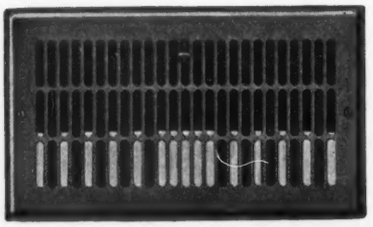


Classic Register No. 2010 (Wall). No. 2020 (Base).

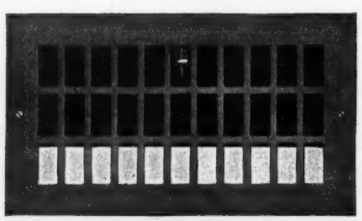
● *Write for new Catalog 36* ●



Classic Wall Register No. 2030 with band frame.



Classic Wall Register, Air Directing, No. 2230 (Fixed blades). No. 2130 (adjustable blades).

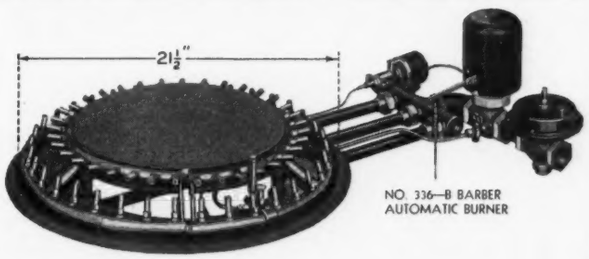


No. 2030 Oblong Register

Only

BARBER BURNERS

HAVE ALL THESE OUTSTANDING FEATURES!



FOR 18 years, Barber Conversion Burners have been in a class by themselves—not just because we say so, but because that many years of patient development put them there. Barber Burners cut down removals and servicing. That's why Barber Dealers sell MORE Burners — and sell a *better* class of trade. Barber is the *safest* Burner to sell on the time payment plan. Many Gas Companies *prefer* to finance *Barber* Burners sales for the Heating Trade. Right now there is a big upswing in Conversion Burner business. With Barber Burners, you can outsell competition *every time*—if you bear down on these specific points:

- Eight different sizes to accommodate round grate diameters from 12" to 34". Also "tailor-made" to *suit* and *fit* the grate dimensions of oblong furnaces or boilers.
- Insure a "scrubbing" flame action on side walls of firebox, at the proper level, with 1900° Fahrenheit flame temperature.
- No fire brick or refractory elements needed — Barber Burners require only 70% of the installation time of Burners using such elements.
- Equipped with the improved Barber noiseless jets, unequaled for air-mixing efficiency.
- Furnished with Klixon or Baltimore Safety Pilot Control—positive and accurate.
- Listed in the A. G. A. Directory of Approved Appliances.

We supply Sales Literature, Specification Data Sheets and Practical Sales Assistance. Write at once for latest Illustrated Catalog and Revised Price List.

THE BARBER GAS BURNER CO.
3704 Superior Ave. Cleveland, O.

BARBER *Automatic* JET GAS BURNERS

● for Warm Air Furnaces, Steam and Hot Water Boilers ●

and Numerous Other Heating Appliances

The New Home of the

U. S. Department of Justice

AEROFIN

FAN SYSTEM HEATING AND COOLING SURFACE

THE judicious selection of the best fan system heating surface, logically falls on Aerofin. Measured by the highest standards, Aerofin always lives up to specifications. This standardized light-weight fin-type surface has proved its high efficiency, dependability and long life in thousands of installations throughout the country.

For any job requiring forced fan heating or cooling, Aerofin is almost always the choice of experienced architects, consulting engineers and progressive heating contractors. If you do not know about Aerofin, investigate today—include it in the specifications for your next job. You will agree with others when they say that Aerofin gives them all they have wished for in a heating surface.

A complete line of equipment for heating and cooling is at your service. The home office in Newark or any of our branch offices will gladly send complete descriptive literature or render prompt personal and efficient technical co-operation. Simply write to the address below.

AEROFIN CORPORATION
850 Frelinghuysen Avenue
Newark, N.J.
Chicago Detroit New York Philadelphia

AEROFIN is sold only by Manufacturers of Nationally Advertised Fan System Apparatus. List upon Request

Konzo—Registers

(*Continued from page* 38)

D. Pressure Loss and Air Deflection

Installers have been aware of the advantages to be gained with the use of registers which will deflect the air as it leaves the register and enters the room. In some cases, for instance, it may be desirable to project the air into the room in a single "core," as shown in Fig. 6 in order to obtain the maximum "throw" of air. In another case, a more fan-wise distribution may be desired, as illustrated by Fig. 7. Air deflections, similar to that shown in Fig. 7, are obtainable with the proper type of commercial, forced-air registers.

The relative magnitudes of the frictional resistance for the registers with undeflected and deflected flow of

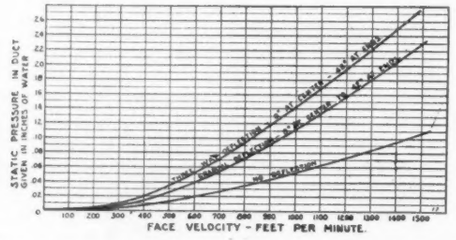


Fig. 8—Chart showing resistance to air flow for various angles of deflection of the air.

air are shown by the two lower pressure curves in Fig. 8. It may be noted that the pressure necessary to deflect the air in a manner similar to that shown in Fig. 7 was approximately twice as great as the pressure required when no deflection of air was accomplished. From these and similar data, the author has made the general recommendation that, *"for registers of the deflecting type, use twice the pressure values listed in Table 1."*

E. Pressure Loss and Air Projection

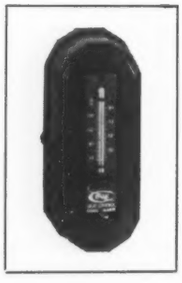
Two interesting charts from a manufacturer's catalogue show the intimate relationship which exists in the type of register, angle of deflection, distance of throw, and frictional resistance. The left hand chart in Fig. 9 shows the path of the air currents with a very small angle of spread. The table underneath the chart indicates the initial velocity required and the pressure resistance imposed for various distances of "throw." For example, it may be noted that with this given type of register, the air can be projected to a distance of 40 feet, provided that the initial velocity at the register face is equal to 750 feet per minute. The frictional resistance of the register in this case is equal to 0.061 in. of water. The velocity of the air at the distance of 40 feet from the register will be equal to 40 feet per minute, which has been established by the manufacturer at the maximum velocity allowable in the living zone. With the same register the air can be projected to a distance of 20 feet with an initial register velocity of 375 feet per minute and an accompanying frictional resistance of 0.018 in. of water.

When the air is given a very wide angle of spread or deflection the velocity and pressure required at the register face is much larger for a given distance of projection into the room. This is illustrated by the

COOK CONTROLS

for

DOMESTIC HEATING SYSTEMS



Listed as Standard by Underwriters Laboratory

Approved by the Anthracite Institute

For Warm Air, Hot Water or Steam

For Gravity, Forced Air or Zoned Systems

Safe, Quiet, Dependable and Reasonably Priced

Descriptive Literature on Request

COOK ELECTRIC COMPANY

2700 SOUTHPORT AVE. CHICAGO, ILL.

WHY DO YOU SELL WILL-BURT STOKERS ?
DE LUXE 40-50 DOMESTIC STOKER
BECAUSE THEY REQUIRE LESS SERVICING THAN ANY OTHER STOKER I HAVE EVER KNOWN

BUILT TO GIVE ENDURING SATISFACTION

Dealers often tell us that one of the reasons they took on the Will-Burt line was because they found on careful investigation that Will-Burt Stokers required so little servicing.

This is the natural result of the policy outlined by the president of the company, Mr. B. G. Cope:

"It has been said that Will-Burt Stokers are built more substantial and to more exacting specifications than necessary. No matter how well a piece of Will-Burt equipment may be built, it is not made better than it should be. Our first object is to build stokers of quality materials and careful workmanship so that they will give users the carefree service and enduring satisfaction which they expect and to which they are entitled."

Will-Burt dealers tell us that every Will-Burt Stoker they install gives them another enthusiastic salesman who is not on the pay roll.

If this is your idea of a good line to represent, write us.

Air Controlled WILL-BURT STOKER

THE WILL-BURT CO.
Automatic Coal Burner Div.
ORRVILLE, OHIO

Manufacturer of Will-Burt Domestic and Commercial Stokers with the Original Automatic Air Control.

These Registers are GOING PLACES! in a BIG WAY

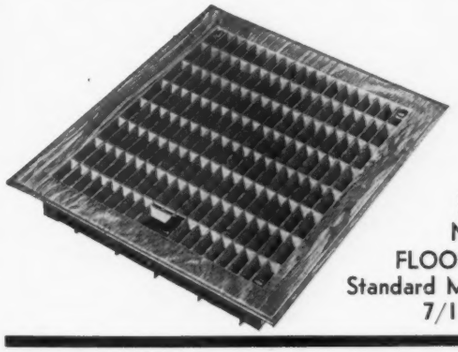
H & C No. 120
BASEBOARD REGISTER

Made to be installed with the stackhead overlapping the Frame.

NEVER in our long history of register building have we brought out new items which have so quickly captured the interest of progressive installers as the H&C No. 120 Baseboard Register and the H&C No. 210 Floor Register. From coast to coast these items already are outstanding favorites and their popularity continues to grow by leaps and bounds.

What's the reason? Well, if you are the alert type of installer that knows how well it pays to handle the best registers available, you'll quickly discover it when you look them over. The No. 120 incorporates the same attractive face design used in our highly popular No. 110 line of Baseboard Registers—plus a perfected valve mechanism and STREAK-PROOF construction that makes it a knockout. The No. 210, as you will readily note, is a distinctly superior grid-type Floor Register featuring narrow mesh, with openings only 7/16" wide. STRONG, RIGID, HEEL-PROOF, but no premium price over ordinary floor registers! The H&C new Oak finish makes the register look part of the floor itself.

Tell your Jobber, NOW, that you want nothing but H&C Registers. They will help you make sales and build good will for you.



H & C
No. 210
FLOOR REGISTER
Standard Mesh—
7/16 x 1 7/16".

HART & COOLEY MANUFACTURING CO.
Warm Air Registers · Regulator Sets · H&C · Air Conditioning Grilles · Dampers · Chain
61 W. KINZIE ST. · CHICAGO · ILLINOIS

chart on the right hand side of Fig. 9 which shows the characteristics of a register which gives a much larger angle of deflection to the air than the register whose characteristics are shown on the left side of Fig. 9. With this register the air can be projected 20 feet into the room with an initial register velocity of 700 feet per minute and an accompanying frictional resistance of 0.060 in. of water.

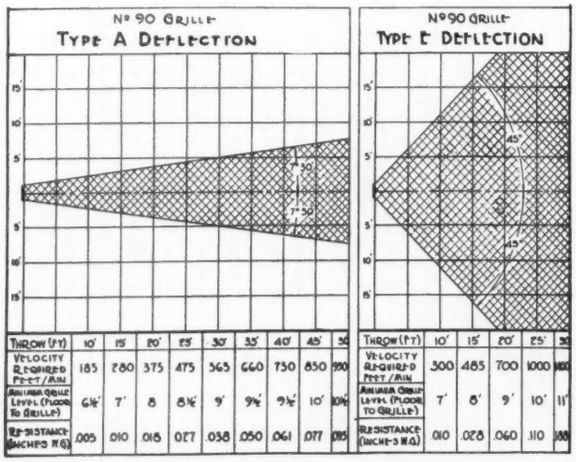


Fig. 9—Performance charts for two registers showing relationship that exists between type of register, angle of deflection, initial register velocity, distance of "throw" and frictional resistance. Courtesy of Hart and Cooley Mfg. Co.

These two examples shown in Fig. 9 illustrate not only what can be accomplished in the way of air deflection by relatively simple changes in the warm air register, but show also the differences in the initial velocity pressure and the differences in the frictional resistance brought about by operational methods that require various distances of air projection. It should be evident from the preceding examples that:

a. Registers are available to meet a wide variety of conditions that may be imposed by the installer.

b. Each requirement of the installer may impose a frictional resistance that must be overcome by the fan to be selected for the installation.

c. For precise work it is recommended that the pressure losses for the actual register to be used should be chosen in preference to generalized values.

d. In any case, where high register velocities are used, the frictional resistance of the register should not be ignored in making an estimate of the "static pressure" of the installation.

e. It is urgently recommended that the installer thoroughly familiarize himself with the wide variety of available registers offered on the market.

ROUND OAK FURNACE AND AIR CONDITIONING SALES SHOWED A BIG INCREASE DURING 1935

Furnace sales this year are going to be the biggest since 1929 . . . and there is greater demand for Round Oak furnaces and air conditioning systems.

PREPARE NOW! ROUND OAK'S complete line of furnaces and air conditioning equipment is always reliable. Hundreds of dealers are selling them profitably.

ROUND OAK supports its dealers with engineering assistance, sales and advertising helps, dependable deliveries. Round Oak financing under FHA plan further strengthens and assures your success. Write today for the facts!

DISTRIBUTORS

Haw Hardware Company, Ottumwa, Iowa
The MacIntyre Company Fond du Lac, Wisconsin
Sioux Falls Corrugating Co., Sioux Falls, S. D.
Waterloo Metal and Mfg. Co., Waterloo, Ia.
W. M. Dutton & Sons Co., Hastings, Nebr.
Sam H. Kimbler, Denver, Colo.
Anchor Lite Appliance Co., Pittsburgh, Pa.

The Coal Master
Designed specifically for automatic stoker firing. Not a makeshift or adaptation. High combustion chamber, triple radiators, special clinker chute and receptacle.

The Oil Master
Highly efficient for any make of oil burner. Made of arc-welded copper alloy boiler-plate gas-tight. New in design and construction — thoroughly tested in practical service. Saves fuel and assures years of excellent service. Adapted for gas burning with conversion burner.

ROUND OAK COMPANY
Stoves - Ranges - Furnaces - Air Conditioners Since 1871
DOWAGIAC, MICHIGAN

Illustrated above are just two of Round Oak's big furnace line.

"Check-up Time is Profit-Time"

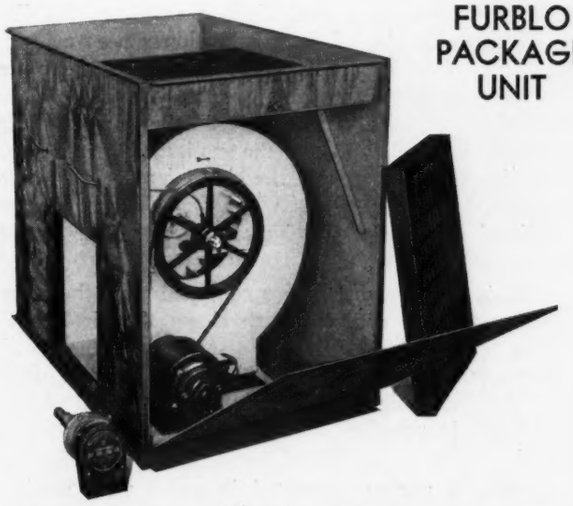
—says I. W. Rowell

"The time is ripe right now to start a real check-up campaign on the furnaces in town to see how they're operating, see what they need and to see what services or repairs you can sell.

"Right now, when the deficiencies of 'sick' furnaces are fresh in your prospects' minds, you can easily get a receptive ear to your sales story on the Furblo Package Unit. The time to strike is when the iron is hot—or, in this particular case, when the prospect is cold."

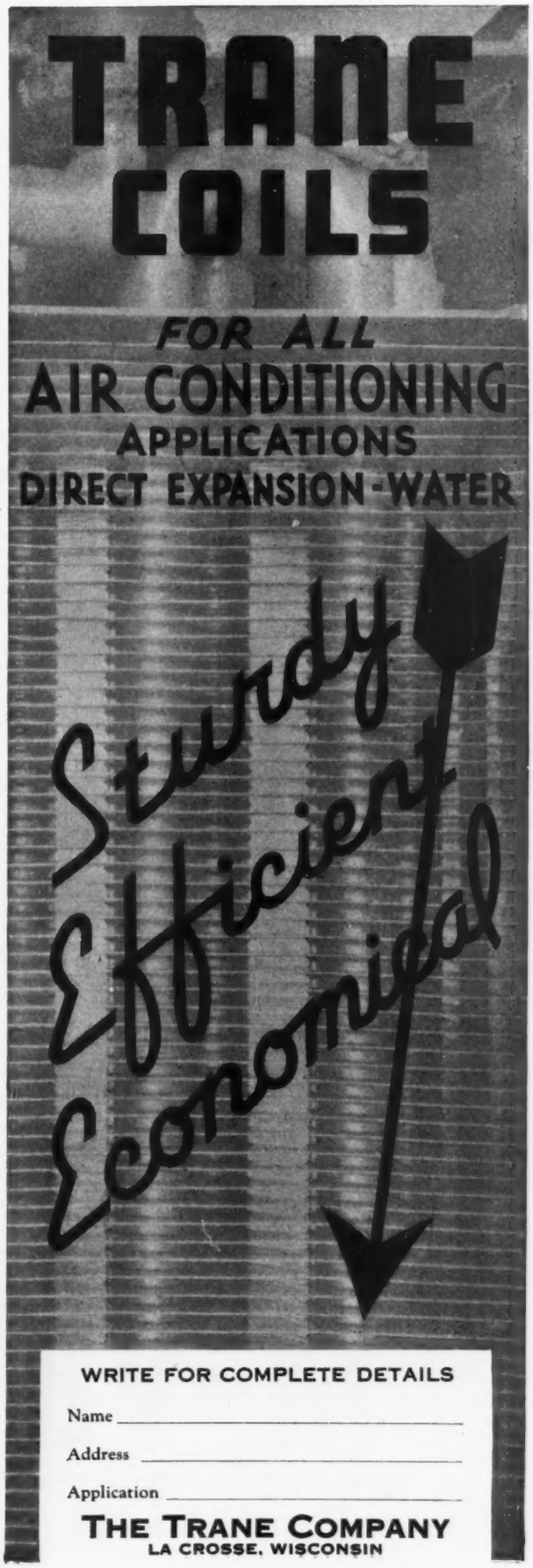
—I. W. ROWELL, MANAGER
FURBLO COMPANY

THE FURBLO PACKAGE UNIT



FURBLO
COMPANY
HERMANSVILLE, MICHIGAN

PIONEERS IN RESIDENTIAL AIR CONDITIONING



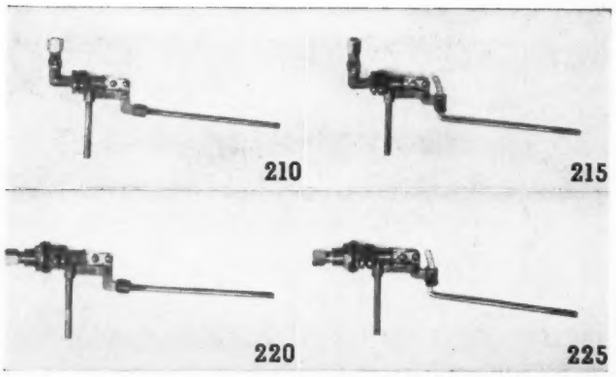
WRITE FOR COMPLETE DETAILS

Name _____

Address _____

Application _____

THE TRANE COMPANY
LA CROSSE, WISCONSIN



THE MARK OF THE MODERN FURNACE

AN M-VB HUMIDIFIER VALVE

Better for health, better for comfort . . . that's why any furnace equipped with an M-VB Humidifier Valve is a *modern furnace. Automatic control* is the explanation—the M-VB does away with hand-filling of the water pan, never lets the pan run dry. It automatically maintains the proper water level at all times.

Most warm air furnaces can be equipped with the M-VB Humidifier easily and quickly. Four models are available—for top-of-pan or side-of-pan insertion, with float position set or adjustable.

M-VB's famous quality materials and fool-proof construction assure this valve a long life. Full directions and all necessary fittings for a complete installation are packed in a neat box. Write to the address below to learn the full possibilities of this valve as a sales-aid.

M-VB

MORENCY-VAN BUREN DIVISION
Scovill Manufacturing Company
STURGIS MICHIGAN
A Complete Line of Closet Tank Fittings

Gas Burner Controls

(*Continued from page* 35)

Steam was discharged from the boiler through a piece of 3½-inch pipe about 2 feet long, set vertically, which was then connected to a 1½-inch steam separator, to insure the discharge of dry steam. Both the separator and the pipe by which it was connected to the boiler, were covered with asbestos insulation about 1 inch thick. The drip connection of the separator was piped to the bottom of the boiler, so that any moisture in the steam was returned thereto.

Beyond the separator was a 1-inch globe valve, adjustment of which allowed the maintenance of proper pressure in the boiler. The steam pressure was read in inches of mercury from a U-tube manometer to avoid inaccuracies of the pressure gauge. An Orsat apparatus was used to determine the volume percentages of CO_2, oxygen, and CO in the flue gas. A thermocouple for measuring the temperature of the stack gases, and a tube for sampling them for analysis were inserted into the center of the vent pipe when it joined the boiler.

Four Types Tested

Four different makes of conversion gas burners were tested. Two of these were of the Bunsen type; one had the Bunsen tubes inclined so as to throw the flame against the combustion chamber walls, while the tubes of the other were vertical, and fire-brick baffles were used to spread the flame to contact with the walls. Another burner consisted of four cast-iron, box-like units in the center of the combustion space; a heavy cast-iron plate, or baffle, about 10 inches above the burner tops, threw the flame over to the walls. These first three burners were of the blueflame type. The fourth gave a yellow flame; the gas issued from a number of small holes around the circumference of a cast-iron ring, in the center of which was a heavy circular block of fire brick. All burners were of the atmospheric type.

All of these burners were equipped with the intermittent type of control which closes the air damper when the gas is off. For one series of tests, the air door was disconnected so that it remained open. During the throttling tests, the intermittent control was rendered inoperative, and the gas was throttled by hand.

Two gas meters connected in series were used to measure the gas consumption. These meters were tested with a prover once before and once during the tests. Each was equipped with a counter actuated by the one-foot hand, so that they could be read to within one cubic foot. Results are based on the average of the two readings. Gas pressure at the meters was about 8 inches of water.

The gas used in the tests was taken from the mains supplying the city of Fayetteville. Its heating value was found to be 983 B.t.u. per cubic foot at standard conditions; that is, a pressure of 30 inches of mercury, and a temperature of 62 degrees Fahrenheit.

Peerless

VENTILATING EQUIPMENT

PEERLESS MULTIBLADE FANS ARE SUPERIOR

Fully enclosed capacitor motors, no dust or moisture can reach windings. Heavy galvanneal blades insure long life. A complete line 12 to 30 inch to meet all ventilation requirements.

Ask for Catalog 204

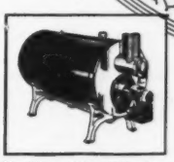
DIRECT AND BELT DRIVE BLOWERS

STANDARD PACKAGE BLOWERS

SPECIAL BLOWER UNITS

BLOWER WHEELS 4½—15 inch diameter

THE PEERLESS ELECTRIC CO.
Fan and Blower Division
WARREN OHIO



Nu-Way "Genii" Automatic Hot Water Heater

Easy to install. Efficiency 50% to 70% saving over gas in most communities.

Consider Nu-Way

Burns Number 1, 2, or 3 Fuel Oil. A quality product.

The reputation of every oil burner dealer is dependent upon the product he installs in his territory.

Future sales, replacement jobs and good will are all built upon the service you deliver in your sales of today.

If you expect to continue in business for ten years or more, we ask you to consider Nu-Way.

Nu-Way automatic oil burners have always been built to deliver the maximum service.

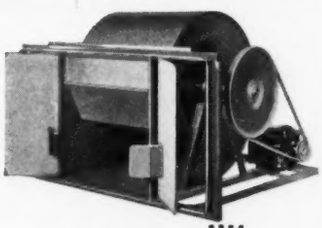
A Nu-Way franchise has proven valuable to many old reliable oil burner dealers throughout the United States.

Write today and let us prove to you why you should consider Nu-Way—one of America's old reliable quality oil burners.

The NU-WAY CORP. ROCK ISLAND ILLINOIS

A C BLOWERS

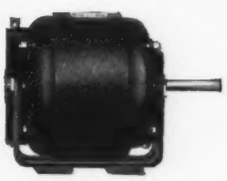
WITH THE PATENTED AUTOMATIC BY-PASS LOUVRES



A. C. Blowers are designed specifically for warm air furnace installations. The low, wide outlet provided by the special cutoff piece, assures uniform distribution of the air around the firepot. Ratings are guaranteed. Write NOW for new Bulletin No. 48 containing complete performance data and selector charts.

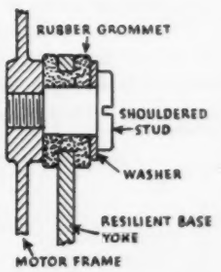
Air CONTROLS INC.
Division of
The Cleveland Heater Co.
1935 W. 114th St.
Cleveland, O.

Vibration Cannot Pass This *Uncompressed* Rubber Mounting



Available in Ohio Flange-Mounted Motors, too.

FOUR soft rubber grommets (not compressed) support the motor resiliently. They carry the motor weight and torque, and isolate vibration practically 100 percent. Rubber loses its resiliency in proportion as it is compressed. The shoulder studs which secure motor to cradle cannot be screwed in far enough to compress.



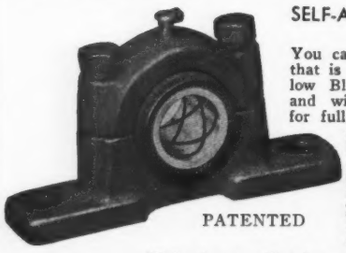
Cross section shear type resilient motor mounting.

If you are interested in isolating vibration and noise, write us.

The Ohio Electric Mfg. Co.
5910 Maurice Ave. Cleveland, Ohio

OHIO MOTORS

RANDALL PILLOW BLOCKS



SELF-ALIGNING
SELF-LUBRICATING

You can always be sure of a job that is equipped with Randall Pillow Blocks. It will run quietly and without interruption. Write for full details today. Let us tell you why Randall Pillow Blocks have become standard equipment with the leading manufacturers.

PATENTED

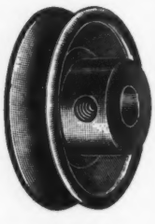
Randall Pillow Blocks now have the ball machined and races ground insuring accurate fit.

Write for new Catalogue just out

RANDALL GRAPHITE PRODUCTS CORP.
609-613 WEST LAKE ST. CHICAGO, ILL.

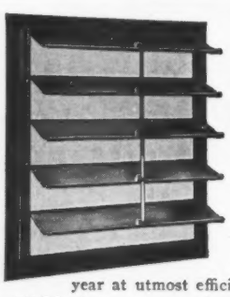
MAUREY PULLEYS PULL SALES

Distributors and Dealers look to see that Maureys are standard equipment on the air conditioning and stoker equipment they handle. They know that there will be no sales resistance on the pulley score, and that there will be no complaints on service.



Write for literature and use Maurey Steel-V Pulleys to Pull Sales

Maurey Mfg. Corp., Wabash at 29th, Chicago

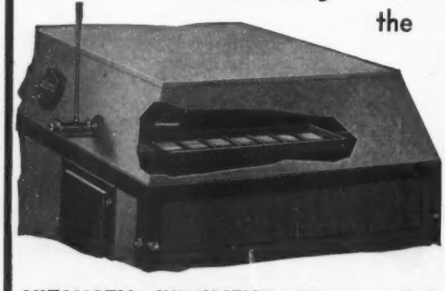


ELGO
AUTOMATIC SHUTTERS

The ELGO Automatic Shutter actually saves you money by adding years of life to your fans and motors. Protected from rain, dust, snow, etc., by ELGO shutters they function year after year at utmost efficiency and with a minimum of service. ELGO shutters operate by gravity and are designed for use with Propeller or Disc Fans, Impellers or Blowers. Try ELGO shutters once and you'll use them every time. Write today for further information.

ELGO SHUTTER & MANUFACTURING CO.
DETROIT, MICHIGAN

HUMIDITY — The most important part of winter air conditioning is best acquired by the Automatic Drip.



Get our catalog and prices.

AUTOMATIC HUMIDIFIER CO., - Cedar Falls, Iowa

Humidification

(*Continued from page* 33)

—both having the same size furnace. This very definitely proves that the **size of evaporating pan required is not governed by the size of the furnace or of the house.**

Comparison of the evaporative rates for pans in furnaces having gravity circulation with the evaporative rates of pans in furnaces having forced circulation conveys additional important facts. Note that in a gravity job having its leaders proportioned for 170 degree register temperature in zero weather the evaporative rate will be 4.1 gallons per square foot, but if the ducts are designed for forced air circulation and the same register temperature in zero weather, the evaporative rate during 35 degree weather will be only 2.7 gallons.

Of course when a gravity job is converted to a forced air circulating job, the air velocity increase will cause a reduction in bonnet temperature. A typical case is a Code designed heating installation (175 degree register temperature) evaporating 4½ gallons per square foot, converted to forced air circulation and then having 160 degree register temperature in zero weather. This reduces the evaporative rate to 2.3 gallons per square foot. The water pan will then have to have twice its former water surface area, assuming that its former area was sufficient for 35 degree weather.

Having found how many gallons of water are required to be evaporated per day, select the rate of evaporation per square foot that can be expected from an evaporating pan in the furnace under consideration and divide the required total evaporation by the expected evaporation per square foot of water surface and the result will be the required area of the evaporating pan in square feet.

You will probably find that the required size of evaporating pan is larger than you expected. If the required water surface area seems impractically large, reduce the evaporation required by eliminating needless outdoor air intake area and weather stripping the windows.

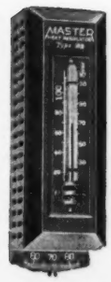
The result of a water pan that is too small will be that the room humidity obtainable in 35 degree weather will be proportionately less than 40 per cent—about 1 per cent point less for each 5 per cent shortage of water surface. Thus a water pan that is 25 per cent short of the required water surface will be able to maintain a maximum indoor humidity of about 35 per cent during 35 degree weather, instead of 40 per cent but will be able to maintain 35 per cent humidity or higher in colder than 35 degree weather.

Controlling Room Humidity

The water surface area of a humidifying pan must be large enough to evaporate sufficient water to raise the room humidity to 40 per cent during bonnet temperature existing in 35 degree weather. As

Only $13.50 to dealer

TYPE B-22
Two-Position



MASTER HEAT REGULATOR

A Railroad President can't buy a better regulator than a "MASTER"—and here's a "MASTER" for the average home-owner. Noiseless, accurate, responsive to one degree of change, easy to install and will outlast the heating plant. Underwriters Laboratories list it as standard. A money-maker for you.

Made by the manufacturers of the famous Type B-144, the Original Gradual Control Heat Regulator.

WHITE MANUFACTURING CO.
2362 University Ave., St. Paul, Minn.

For furnace manufacturers who buy wheels only. Clarage offers any size desired, and can meet any quantity requirement. Clarage Wheels can be furnished standard width, or any percentage of standard width to deliver a specified volume of air at any operating speed. All wheels are PERFECTLY BALANCED for quiet operation without vibration.

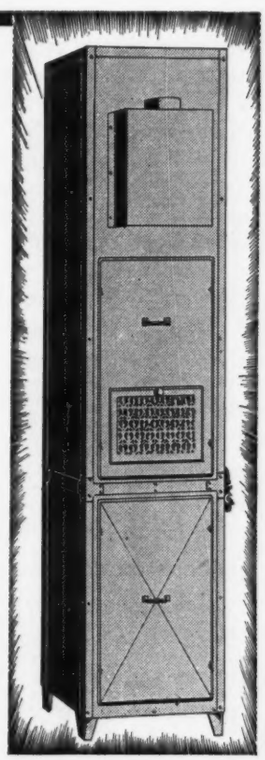
Clarage Furnace Fans (complete assemblies) combine many advantages. They are positive centrifugal type, very compact, highly efficient, and the low speeds insure SILENT OPERATION. Inlets and outlets are drilled with holes for easy attachment to ducts.

Clarage Fan Company, Kalamazoo, Michigan

CLARAGE
Air Handling and Conditioning Equipment

Forced Air Heating Without a Basement

★ PAYNE "FAU" FURNACE



A complete heating unit, blower and all control equipment under one casing and occupying no more space than a water heater or ice box. Installed on back porch or in a closet. No basement is required. A maximum of radiation surface, free air passage and proper insulation combine to make this unit exceptionally efficient and economical.

Designed for burning gas, this unit eliminates fuel storage problems and insures clean, even warmth at low cost.

Neutral finish combines readily with decorative schemes and makes the unit extremely attractive.

Write for descriptive literature.

PAYNE FURNACE & SUPPLY CO.
BEVERLY HILLS • • • CALIFORNIA

HESS FURNACE AIR CONDITIONER BLOWER FILTER UNIT

NEW NO. 10 HESS AIR CONDITIONER

Cabinet style, rounded corners, green and black crinkle enamel finish, for use with any furnace, circulates approx. 1000 C.F.M. thru average furnace system. Air is filtered and passed thru water action for proper humidity in heating season. No sprays or solenoid valves used. Priced low to reach the largest small home, market.

HESS NO. 1—NO. 2—CONDITIONERS

Capacities up to 2000 C.F.M.

HESS BLOWER FILTER UNITS

Capacities up to 2500 C.F.M. Our prices offer exceptional values and Saleability.

HESS AND BENEFACTOR FURNACES

Are rectangular, welded steel, brick lined. In a wide range of sizes and prices, with numerous exclusive features of quality and outstanding performance.

HESS EQUIPMENT

IS distinctively different and Hess dealers can beat ordinary competition.

WRITE FOR DEALER PORTFOLIO
HESS WARMING & VENTILATING CO.
1211-27 S. WESTERN AVE., Founded 1873
CHICAGO, ILLINOIS

Fans

Include International Fans when planning air-conditioning layouts this season. Ideal for attic ventilation, etc.

Also include the Dayton furnace unit—to filter and cool the air in summer—to filter and heat it in winter.

Also line of general industrial fans of highest efficiency rating. Bulletins on request.

INTERNATIONAL ENGINEERING, INC.
DAYTON, OHIO

INTERNATIONAL

GET YOUR LAYOUTS FROM Gar Wood DEALERS

Take your jobs to the Gar Wood dealer. Have him make an engineering layout for you to figure your sheet metal cost. The Gar Wood dealer wants to cooperate with established sheet metal workers in getting residential oil heating and air conditioning business. You will be given prompt attention and your interests will be duly safeguarded during sale negotiations.

Write today for HOME HEATING data. There is no obligation.

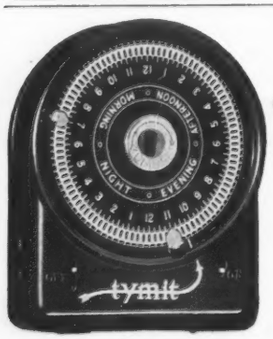
GAR WOOD INDUSTRIES, INC., AIR CONDITIONING DIVISION
7924 Riopelle Street, Detroit, Michigan.

The WISCONSIN HUMIDIFIER

Will improve any Warm Air System. Nothing to get out of order, so no service calls.

Ask your jobber or write

WISCONSIN HUMIDIFIER CO.
3231 N. Richard St. Milwaukee, Wis.



$8.05 net

Tork Clock Company
MT. VERNON, NEW YORK

Please send me quantity prices and wiring diagrams for connecting TYMIT, your new popular time control for

- ☐ oil burners
- ☐ gas burners
- ☐ stokers
- ☐ ventilating fans

Name .....
Address .....
City .....*State*.....

weather gets colder the bonnet temperature will become higher and the rate of evaporation will increase rapidly. To prevent the excessive room humidity that will occur to an increasing extent as the weather and windows become colder, the rate of evaporation must be limited by the rate at which water is fed to the humidifying pan.

One method of controlling the room humidity is by means of a humidistat located in one of the rooms. This is manually set to maintain the desired room humidity, being reset to lower humidity as weather gets colder and to higher humidity as weather gets warmer. Resettings must be fairly frequent in homes having single glass windows.

Water Feed Methods

Humidistats automatically turn the water supply to the evaporating pan fully "on" when more evaporation is required and "all off" when less evaporation is required. Such humidistats cannot, however, control the room humidity accurately unless the evaporating pan has adequate water surface area and is properly proportioned as to depth. The rate of water feed should also be throttled down to not over two or three times the required rate of evaporation for 35-degree weather. If the feed rate is too rapid it will chill the water in the pan to an extent which may reduce instead of increase the date of evaporation. A combination of excessive rate of water feed and excessively large water volume in the pan can make a humidistat almost useless.

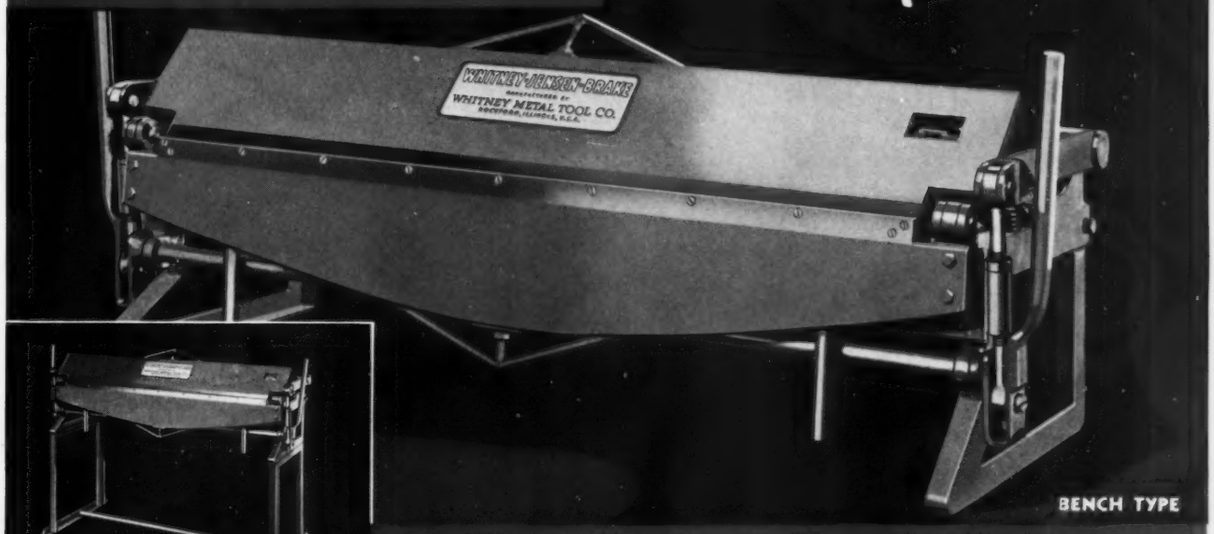
Another method of humidity control is to feed the water to the evaporating pan at a consistent rate regardless of weather. When the feed rate is set at a point that will raise the room humidity just up to the window condensation point it will cause the room humidity to become less as weather gets colder and higher as weather becomes warmer, closely following the window condensation point and thus automatically preventing excessive window condensation.

Several other humidity controls designed to graduate the room humidity to automatically conform to changes in weather and window temperatures are at this writing in process of development and will no doubt soon be announced by their manufacturers.

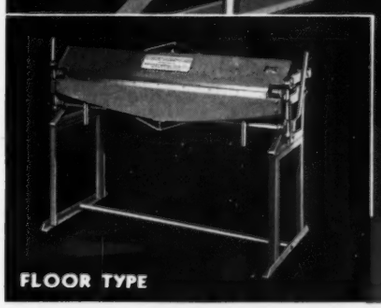
It is our belief that most contractors have encountered problems in humidification for which there seemed to be no ready answer. Because other readers are similarly interested we invite contractors to send in such problems. We will endeavor to secure the best information and suggestions. In sending in such questions be sure to furnish full data on all effecting factors.

49 in. 20 ga. Capacity...
Weighs Only
265 Pounds...

"Air Conditioning Special..."



BENCH TYPE



FLOOR TYPE

The first of its kind offered to the trade...

Whitney JENSEN Portable BRAKE

The "AIR CONDITIONING SPECIAL"

- Easily Carried by Two Men
- Made in Bench and Floor Types
- For all Plain and Reverse Bending
- Has Every Feature of a Standard Brake
- Quickly Adjustable to Different Gauges
- High Quality Construction . . . Popular Low Price

Carry YOUR BRAKE to THE JOB

This new light-weight bending brake is offered in response to a number of requests from practical sheet metal men. Modern air conditioning and ventilation duct work requires so much cut-and-try fitting during installation that a machine of this kind—which can be *carried to the job*—will pay for itself quickly in worth while savings of time and expense. It has full 49-in. jaws with ample clearance at the ends for turned up edges, seam folds, and the like. Removable front plates permit reverse bends as short as 3/16 in. Many other outstanding features of the larger Whitney-JENSEN Brakes have been incorporated in this special portable model. Those who have tried it say it is one of the most useful machines ever designed for sheet metal workers. Send for full descriptive literature and prices . . .

WHITNEY METAL TOOL CO.
91 Forbes Street,
ROCKFORD, ILL.

WHITNEY METAL TOOL CO.
ROCKFORD, ILL.

Gentlemen: Please send information and prices regarding the Whitney-JENSEN "Air Conditioning Special" Portable Brake.

Date.....

AA3

Name

Address

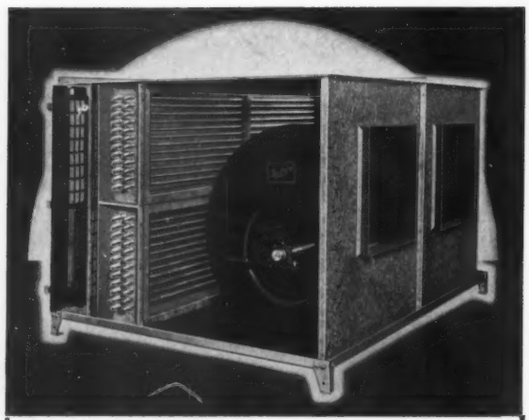
City

State

Temperature!

Humidity!

Cleanliness!



FLASH! COMFORT CONDITIONER SALES SOARING—

With hot weather well ahead Buffalo "PC" Comfort Conditioners are being installed in increasing numbers. These flexible units are practical for many installations because they are available in combinations which provide everything from simple cooling or heating to complete year round air conditioning.

You'll want a copy of Bulletin No. 501 showing these and other units, if you are considering the installation of ventilating or air-conditioning equipment.

Write for it.

You've got to have all four to have air conditioning—and they must be "under control."

Because Buffalo has built air conditioning equipment since the beginning of the century, we admit that we know something about it. You'll want equipment with the engineering advantages arrived at in thirty-five years of successful manufacturing, so select Buffalo Air Washers, Fans, Unit Heaters, Unit Coolers and Comfort Conditioners.

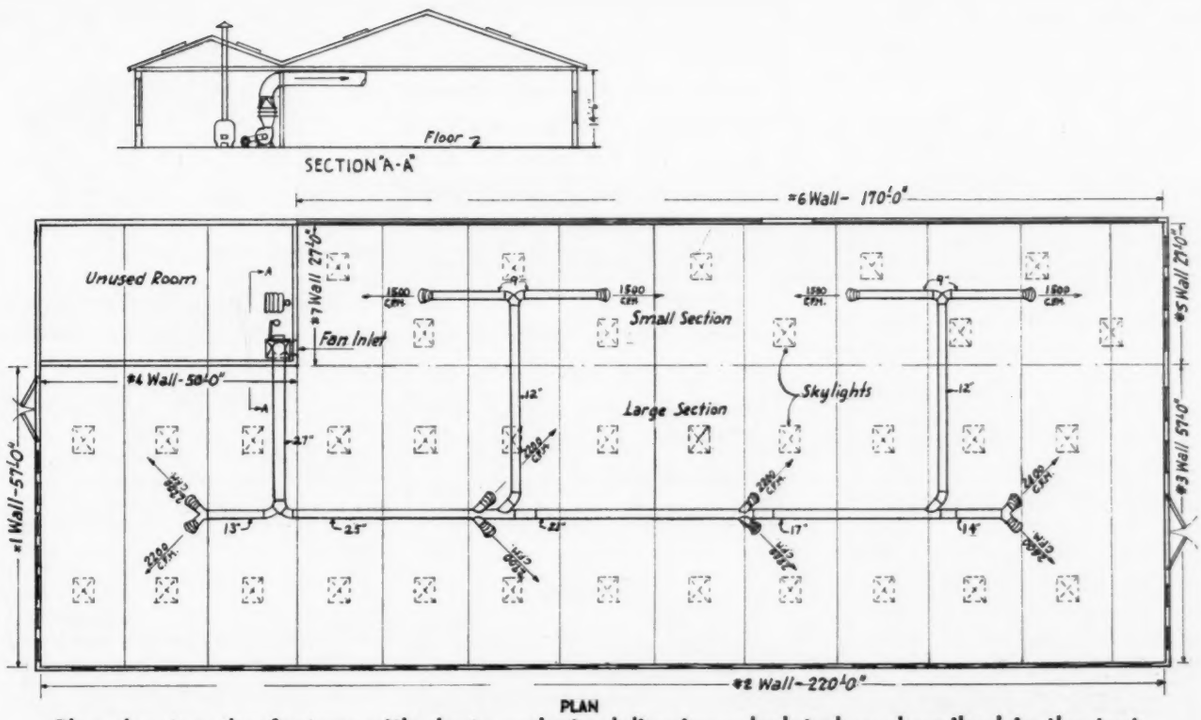
Write for Bulletins.

Buffalo Forge Company

497 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" AIR CONDITIONING EQUIPMENT



Plan showing the factory with ducts and air deliveries calculated as described in the text.

Heating System for a Small Factory

By R. M. Harding

WE were called upon recently to design a heating system for the building shown in the accompanying plans. The owner wanted the system to maintain a temperature of 55 degrees inside the building when the outside temperature was zero.

Following are the calculations we made in determining the amount of heat to be furnished, size of boiler, etc. Our question is—would others use this method or some other method to design the installation?

Our first step was to make a plan of the building, showing the windows, doors, skylights, etc. In order to expedite our work we designated one portion of the building as the Small Section and the other as the Large Section.

Since the American Society of Heating and Ventilating Engineer's Guide is considered authority we followed it very closely. Our heat losses were grouped into two main classifications: Infiltration and Transmission. The loss by infiltration is the heat required to warm the air that filters into the building through open doors, around loosely fitting door, window and skylight frames, etc. Transmission losses are the losses of heat through the exposed walls and other surfaces of the building, due to the difference in temperature inside and outside and to the propensity of heat to pass from one body into another,

Small Section. Transmission Losses

Comp. roof on 1½" boards..29′ 0″x170′ 0″=	4,930 sq. ft.		
Less skylights	200 sq. ft.		
Net roof	4,730 sq. ft.	.56	2,649
10 skylights ....4′ 0″x5′ 0″=	200 sq. ft.	1.13	226
No. 5 wall 12" brick....17′ 6″x27′ 0″=	473 sq. ft.		
Less windows	153 sq. ft.		
Net wall	320 sq. ft.	.36	116
3 windows =	153 sq. ft.	1.13	173
No. 6 wall 12" brick....14′ 6″x170′ 0″=	2,465 sq. ft.		
Less glass	1,645 sq. ft.		
Net wall	820 sq. ft.	.36	173
2/3 of wall is glass =	1,645 sq. ft.	1.13	1,859
No. 7 wall 12" brick....17′ 6″x27′ 0″=	473 sq. ft.	.36	171
Less glass ....27′ 0″x170′ 0″=	4,590 sq. ft.	.52	2,389
Total Btu.			7,774

until equalization results. The constants that we have used represents the heat in Btu. lost through one square foot of wall or other surface per hour per degree difference in outside temperature and the desired temperature of the room.

In our plan we numbered each wall and treated each wall separately in our calculations. The transmission losses for the two sections are as shown in Table I and Table II. The total heat loss for both sections is—

Transmission losses, large section	17,453
Transmission losses, small section	7,774
	25,227

Total transmission losses per hour for 55 degrees of difference between inside and outside of building: therefore,

25,227×55=1,387,485 Btu.

required to effect the temperature rise from zero to 55 degrees.

Not every contractor would calculate heat losses and design a factory heating system by the method described by the author of this article. Probably other contractors will feel that their method is to be preferred. If you think so write us describing how you would engineer this job and if you differ with Mr. Harding tell us where and why.

Infiltration

Figuring the loss by infiltration as one change per hour means that we must supply enough additional heat to raise the temperature of a volume of air equal to the cubical contents of the building from zero to 55 degrees, then:

Large section
57′ 0″x220′ 0″x20′ 0″=250,800 cu. ft.

Small section
27′ 0″x170′ 0″x17′6″= 80,325 cu. ft.

Total cubical contents. 331,125 cu. ft.
then:—331,125×55×.02 coefficient
=364,237 Btu. per hr.

1,387,485	Transmission losses
365,237	Infiltration losses
1,751,722	
add 10% 175,172	
1,926,894	Btu. per hour.

Large Section. Transmission Losses

Comp. roof on 1½″ boards	60′ 6″x220′ 0″=	13,310 sq. ft.		
Less skylights		480 sq. ft.		
Net roof		12,830 sq. ft.	.56	7,185
24 skylights	4′ 0″x5′ 0″=	480 sq. ft.	1.13	543
No. 1 wall 12″ brick	20′ 0″x57′ 0″=	1,140 sq. ft.		
Less door and windows		280 sq. ft.		
Net wall=		860 sq. ft.	.36	310
Door 1¼″ thick	12′ 0″x14′ 0″=	168 sq. ft.	.59	100
Seven windows	=	112 sq. ft.	1.13	127
Total		280 sq. ft.		
No. 2 wall 12″ brick	14′ 6″x220′ 0″=	3,190 sq. ft.		
Less windows		780 sq. ft.		
Net wall		2,410 sq. ft.	.36	868
25 windows	=	780 sq. ft.	1.13	882
No. 3 wall 12″ brick	20′ 0″x57′ 0″=	1,140 sq. ft.		
Less door and windows		465 sq. ft.		
Net wall		675 sq. ft.	.36	243
Door 1¼″ thick	15′ 0″x14′ 0″=	210 sq. ft.	.59	124
5 windows	=	255 sq. ft.	1.13	289
Total		465 sq. ft.		
No. 4 wall, 12″ brick	14′ 6″x50′ 0″=	725 sq. ft.	.36	261
Floor 1″ wood on dirt	57′ 0″x220′ 0″=	12,540 sq. ft.	.52	6,521
Total				17,453

C. F. M.

We must now calculate the number of cubic feet of air which we must handle in order to heat the building.

Fixing the temperature of the air leaving the heaters at 130 degrees, the volume is determined by the following equation:

$$C.F.M.=\frac{1{,}926{,}894\times 55}{60\times(130-55)}=$$

23,551 C.F.M.

(55 in the numerator is the number of cu. ft. of air warmed by one Btu.

In the denominator 60 equals minutes, 130 is the temperature of the air leaving heater and the 55 is the desired temperature of the room.

In the above it will be seen that we must handle 23,551 cu. ft. of air per minute, but we have arbitrarily increased the amount to 24,000 cu. ft. of air per minute.

Boiler

Now for the size of the boiler:—
One boiler horsepower equals 33,524 Btu. approx.

Therefore: —
1,926,894÷33,524=57.5 B.H.P.
Add 10% 5.75
Total.....63.25

We should have boiler of at least 65 hp.

Friction Chart

American Artisan:

Your article, "A method for sizing ducts directly from the chart," which appeared in the January, 1936, number of American Artisan is very much appreciated by me. I have been looking for something of this nature for the past year.

One thing, if I may ask, which is not clear and which you did not explain, is how you arrived at the pressure loss (VI-B-5), size of duct and velocity in section E-C.

It appears to me that this was done by working back from the velocity which is the average of the velocities of sections E-F and E-D.

Would you kindly straighten me out in regard to this?

F. M. T., S. Dakota.

Reply by
G. A. Voorhees, Engineer,
Furblo Co.

We are glad to know you found the Friction Pressure Chart of value, and to answer your question more definitely we are sending a larger blueprint of this chart which is easier to read.

The item VI-B-5 is obtained by addition as follows:

Item VI—T-5 for Section AD=0.030
Item VI—T-5 for Section DE=0.015
Item VI—B-5 for Section EC=0.045
(by addition)

The reason for arriving at the friction pressure loss in the branch in this manner is that this loss in branch E-C should be the same as that in the main trunk section E-D-A. If these losses are identical, then (theoretically) the air stream will divide itself in proper proportion without the use of a damper at E.

Having determined the total friction pressure loss in the branch E-C, we convert this to the equivalent friction pressure less per hundred feet of pipe for convenience in determining pipe size and velocity by means of the friction pressure chart. Thus, we find that:

$$\text{Item VI—B-6 for Section E-C} = 100 \times \frac{0.045}{35} = 0.13 \text{ per hundred feet}$$

Having in this way determined the pressure loss per hundred feet of pipe in the section E-C to be 0.13 and having determined (Item VI—B-8) that the volume of air handled by the branch is 468 c.f.m., we locate these two numerical values on two margins of the chart and project as indicated by the red line on the accompanying blueprint. From the point of intersection of these lines, we estimate that the equivalent diameter of the round pipe is about 10.2 or 10.3 and that the air velocity is approximately 800 feet per minute.

This, I believe, covers the specific questions which you ask.

There is a slight error in Item VI—T-5 for the main trunk section A-D which, while it would not be particularly objectionable in actual design, is liable to be confusing to one who is not familiar with the use of the chart and a chart data sheet. Instead of recording this value as 0.030, it should more correctly have been recorded as 0.0295 because the use of 0.030 would give 0.073 instead of 0.072 for items VI—T-6 for section A-D.

$$\text{Item VI—T-5 for Section A-D} = 0.072 \times \frac{41}{100} = 0.02952$$

$$\text{Item VI—T-6 for Section A-D} = 100 \times \frac{0.0295}{41} = 0.072$$

Item VI—T-5 for Section A-D should be the same as Item VI—B-5 for Section D-B. In one case I recorded it on the data sheet as 0.030 and in the other case 0.029. For purposes of explanation and to avoid confusing the reader, both these items should have been recorded as 0.0295.

▲

Galvanized Stacking

American Artisan:

We have been asked frequently about using galvanized iron double stacks on forced warm air jobs in preference to tin and we would like to know who makes such stacking.

M. V. L., Wilsonsin.

Reply by
The Editors

So far as we know, there is no manufacturer of pipe and fittings making double-walled galvanized iron stacking. We have called all the manufacturers' representatives in Chicago and each reports that his concern does not manufacture this type of stack.

You can purchase single walled galvanized stacking from practically any pipe and fittings manufacturer and if you do not have a list we shall be glad to supply one.

The reason for not making double walled galvanized stacks is that in most city codes single walled galvanizing is held to be the equivalent of double walled tin in fire resistance.

▲

Gasoline Smell

American Artisan:

Last fall I installed an International Economy furnace in a residence. There seems to be a good draft and the furnace is cemented up tight, but I have had several calls each complaining of a gas smell similar to kerosene. They claim not to have this trouble in the old furnace. The fuel used is a high grade hard coal.

F. V. P., New York.

Reply by
the Editors

From your description of the problem of gas odor we do not believe that the particular type of furnace used has anything to do with this difficulty.

Without being certain of what you did when you cemented or installed the furnace, we know that when gasoline or kerosene is used on the floor inside the casing, or on the inside of the casing, or in any of the warm air leader pipes as a cleaning fluid, the odor often times remains for weeks or months.

This seems to be particularly true when the cleaning is done in the late summer or fall. The liquid perhaps seeps into the pores of the cement or of the metal, and when the furnace is lit in the fall the increasing temperature, found as the winter progresses, starts evaporation every once in a while, resulting in an objectionable odor.

Of course, we cannot say definitely that this is the difficulty you encountered, but we see no reason to believe that any particular furnace is responsible, and if you are using hard coal there should be no odor similar to kerosene from the fuel.

Perhaps some readers have suggestions?

The Problem Corner . . . . . .

Cheapest Heating

American Artisan:

I would appreciate suggestions on a question under argument. Assuming a temperature of 70 degrees and a relative humidity of 35 per cent in one house and a temperature of 80 degrees and a relative humidity of 15 per cent in an identical house; and assuming equal heat generators in both houses and all conditions identical—which house will require the most fuel per given period of time to maintain its given interior conditions?

S. W., Michigan.

Reply by S. Konzo, University of Illinois

Your letter of inquiry has been referred to me for reply. The conditions as stated in your letter may be briefly itemized as follows: (The data are supplied from the Carrier Psychrometric Table and the ASHVE Comfort chart.)

Case A—
Dry bulb temperature = 70° F.
Relative humidity = 35%
Effective temperature = 65° F.
Moisture content = 37.5 grains per lb. dry air.

Case B—
Dry bulb temperature = 80° F.
Relative humidity = 15%
Effective temperature = 70.2° F.
Moisture content = 22.0 grains per lb. dry air

The heat requirements for both cases will be composed of two items: 1) heat to maintain dry bulb temperature in house, 2) heat to evaporate water required for humidification. For purposes of comparison the first item will have to be computed on some "average day" requirement. In this case I will assume that an average outdoor temperature of 35° F. prevails in your locality. (Comparisons will give different results for outdoor temperatures that differ much from this temperature.) The results of some eleven years of testing in the Research Residence have indicated that, regardless of fuel burned, the fuel consumption will vary approximately in proportion to the temperature difference between indoors and outdoors.

For Case A, this temperature difference is 70°-35° or 35 degrees, whereas for Case B this temperature difference is 80°-35° or 45 degrees. Case B will require approximately 45/35 as much fuel as Case A or approximately 29% more. (On a zero day this ratio becomes 80/70 or 11.4%.)

However, the heat required to evaporate the water for humidification will tend to compensate to some extent the fuel savings based on dry bulb temperature alone. Data from Bulletin 230 enables us to determine approximate water quantities necessary to maintain the two humidity conditions stated. Case A requires approximately 2.5 gallons per 24 hours for each 10,000 cubic feet of space, whereas Case B requires approximately 0.5 gallon. In terms of heat absorption, Case A requires approximately 800 B.t.u. per hour, and Case B requires approximately 160 B.t.u. per hour. Both quantities are practically negligible in the case of the usual house where the heat loss, based on dry bulb temperatures alone, will be of the order of 50,000 to 150,000 B.t.u. per hour.

In other words, we may safely neglect the slight extra amount of heat required for evaporating water *in these cases* and compare the fuel consumption only on a basis of dry bulb temperature differences. As stated before, this extra fuel consumption varied from 11% on a zero day to 29% on an "average" day. It should be kept in mind, however, that we are not comparing conditions of equal comfort in the two cases, since the effective temperature is much higher in Case B than it is in Case A. Therefore, the higher "effective" temperature is obtained with a greater fuel consumption.

▲

Estimating Service

American Artisan:

Can you advise the name of some reliable concern which makes a business of preparing estimates on large jobs for contracts or estimates made from blue prints?

J. E. A., Tennessee.

Reply by the Editors

We can't advise off-hand the name of any concern making a business of setting up estimates, but perhaps there is such an organization which we can refer you to if you will tell us whether the estimate is to be on roofing, sheet metal work or heating.

Do any readers know of such a national service?

▲

Window Condensation

American Artisan:

I have an installation wherein the windows are constantly wet in cold weather despite the fact that there is no humidifier. The house was built several years ago and the return is all taken from the basement.

V. V. Y., Ohio.

Reply by O. J. Kuenhold, Engineer, Monmouth Products Co.

The excessive window moisture shows that the air in the house is excessively moist. The moisture must be constantly supplied from some source. The problem is to find the source. If this constant supply of moisture does not originate in the rooms and since the furnace draws air from the basement, the source of moisture supply must be in the basement. You will probably find that moisture seeps through the foundation walls from where it is evaporated. This is proven definitely if the basement walls are damp during slightly moist summer weather.

The remedy is to install a cold air return duct and discontinue drawing air from the basement. Then ventilate the basement or waterproof the basement walls.

In new houses, plastered in fall, moisture may originate from the plaster which has not had a chance to dry thoroughly. In such cases the windows may be steamy or moist for the first few months of the heating season.

▲

Design Manual

American Artisan:

We are endeavoring to find a manual for installing warm air furnaces, both gravity and forced air. We have been using the Standard Code, but are of the opinion that there may be a simpler method. Recently our local Holland manager showed us their salesman's manual which seemed simple and thorough, telling how to figure the job, estimate the proper warm and cold air pipes and order the material. Do you know of such a book?

F. H. McB., Indiana.

Reply by the Editors

We do not believe that you will find any simpler or more complete information for designing gravity or forced air heating systems than the two methods established in the Standard Code and the Mechanical Code prepared by the National Warm Air Heating Association.

We regret to say that we are not acquainted with the Holland Company's book, but we do not believe that any of the practices recommended in it are better than the practices recommended in our codes.

We have a book, "Forced Air Heating," which we think covers in complete detail all the information required to design a system for forced air. A revised edition of this book will probably be brought out the first part of next year.

The only criticism we have of the Standard Code, and it is not actually a serious criticism, is that the code employs factors for estimating heat loss and sizing the pipes which might more accurately be done under the recognized BTU method.

L. W. Millis of Security Stove and Range Company, Kansas City, Mo., several years ago prepared a series of data sheets to be used by new salesmen. You might get copies of these sheets by writing Mr. Millis.

ANACONDA THROUGH-WALL FLASHINGS

Simple... Adaptable... Moderately Priced

This new flashing is readily bent and cut to fit on the job...then quickly and easily installed. Ridges prevent lateral movement, and are so designed that the water will flow to the outside face of the wall.

Water-tight end joints are made by overlapping one corrugation. Flat ends permit easy soldering when required.

No unsightly ridges can interfere with the free discharge of water, not even on roof and counter flashing bends.

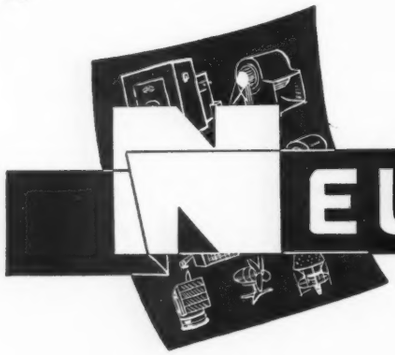
ANACONDA Through-Wall Flashings*, either plain or lead coated and in strips 5 feet long, are carried in stock by distributors of Anaconda Copper. Architects and sheet metal contractors have already shown widespread interest in this simple but highly effective copper flashing which is readily adapted to practically every brick or masonry condition, and is moderate in price.

**Patented May 2, 1933 (Pat. No. 1,906,674)*

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities

ANACONDA
from mine to consumer
85125

ANACONDA COPPER



NEW PRODUCTS

6—Spray Humidifier

A spray type humidifier of new design is announced by the Rega Manufacturing Company, 79 Mount Hope Avenue, Rochester, New York. The humidifier consists of a chamber mounted on the outside of the furnace, containing an expansion wafer and a small heating unit. When the room humidstat calls for humidity an electric circuit is closed with a heating unit which, in turn, expands the wafer and admits water to the nozzle. A special spray nozzle developed by the company shoots a fog of moisture into the air stream under city water pressure so long as the humidistat calls for humidity. If left open the unit has a capacity of seven quarts per hour.

The company has developed a special self-cleaning spray nozzle containing a monel wire cleaning pin.

◆

7—Press

The Niagara Machine & Tool Works, Buffalo, N. Y., announces a new Master Series No. A-4 inclinable open back press. This press has a 4-inch diameter forged and ground main shaft.

Press follows the same general design as the other sizes in the Master Series line and includes quick acting six point engagement clutch, new type slide with breech block die clamp

and equal support for die from center to front and center to rear, double "V" gibs, motor drive on top, self contained anti-friction back gear, compensating brake, and one-man inclining device equipped with anti-friction bearings.

◆

8—Blower

Forct-Air Company, Rockford, Illinois, announce a new line of housed blowers featuring direct-connected, ball bearing, capacitor type motors, filters, automatic bonnet switch, canvas connection and boot. It is claimed that the new unit makes possible return air connection to either side or top. Unit will be supplied in one, two or four speeds for use on 110 volt, 60 cycle current. The company rates the various sizes from 700 to 6500 c.f.m. at a total pressure water gage of from .15 to .60 inches.

◆

△ 9—Seismo Damper

Strength, compactness and a high degree of vibration isolation for medium and light machinery is claimed by the Korfund Company in their new Type-T Seismo-Damper, built in sizes from 100 lbs. to 2500 lbs. capacity. The machine is directly supported by a

T-iron separated from a base of two angle irons by natural cork or other isolating material. The angle irons are firmly connected by bolts passing through the isolating materials and T-iron (but not touching it).

Before installation these bolts are adjusted to produce a precompression of the isolating material to suit the machine load. Further adjustment can easily be made after installation.

◆

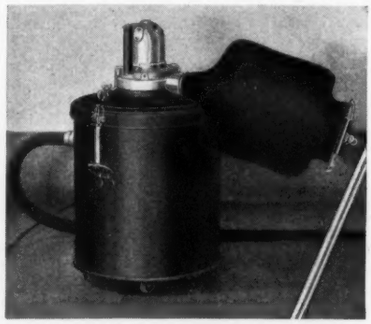
10—Spot Welder

Pier Equipment Manufacturing Company, Benton Harbor, Michigan, announce the Ace spot welder, model No. 60, distributed by the Ward Machinery Company, Chicago, Illinois. The new spot welder is designed for continuous operation and welding up to two pieces of 16-gage steel. It is equipped with water cooled electrodes and has a throat depth of 12 inches. Among the features listed are: an automatic trip switch; welding pressure adjustable from the front; welding pressures up to 5,000 pounds per square inch with a foot pressure of 100 pounds; solid copper horns; a three-point, plug-in-type heat control switch; small required floor area.

◆

11—Cleaner

The Model 101 Premier Furnace and Boiler Vacuum Cleaner introduced recently by the Electric Vacuum Cleaner Co., Inc., of Cleveland, O., features the power unit rated at ½ H. P., high suction power, is demountable and may be removed from the large metal container by simply loos-

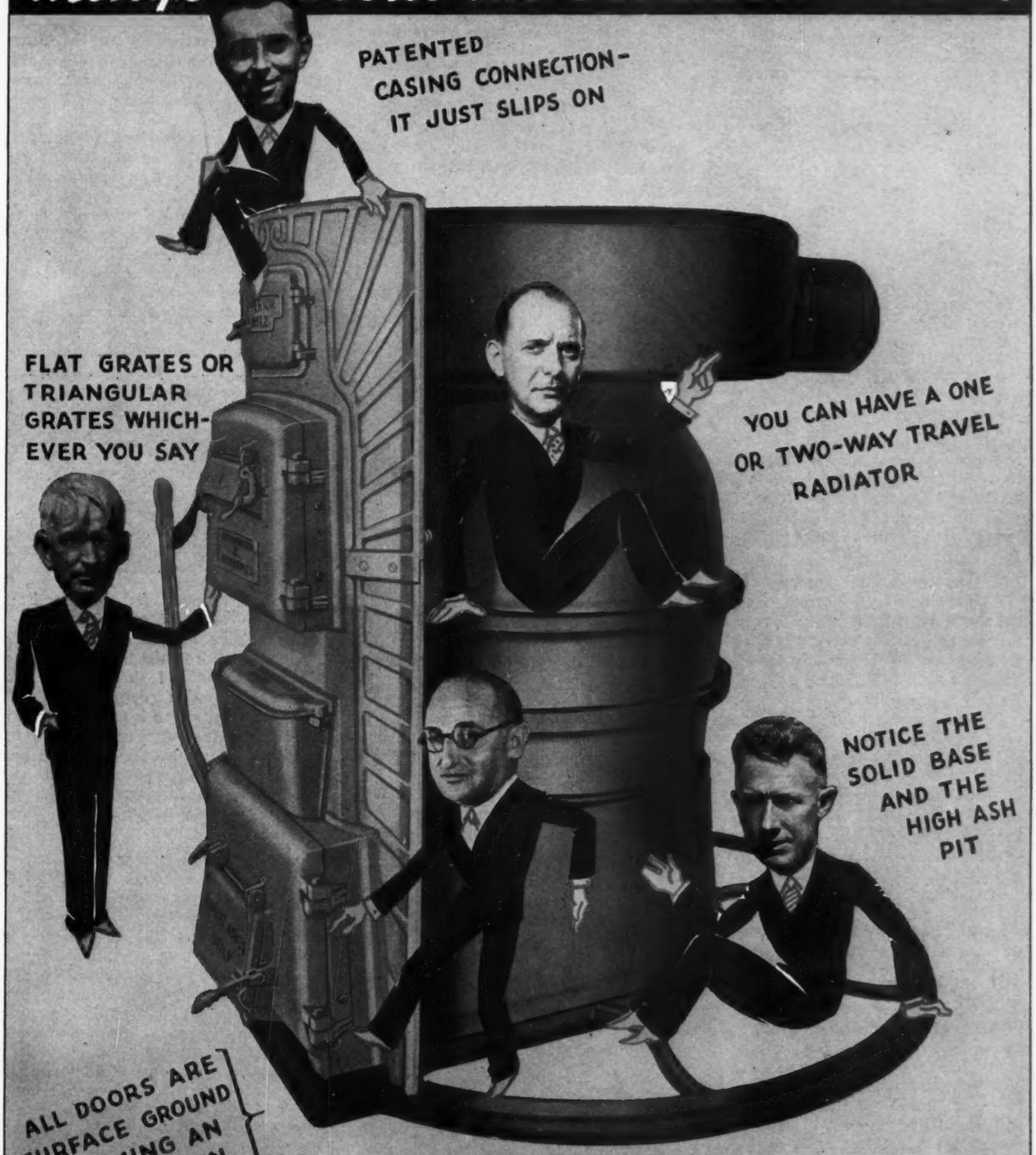


ening two wing nuts, when it is to be used in upstairs rooms for blowing or suctioning dust and dirt out of radiators, registers, grills, air ducts, etc. The cleaning tools are reversible and may be used for either blowing or suction purposes.

◆

● 12—New Machine

Maplewood Machinery Company, 2632 Fullerton Avenue, Chicago, Illinois, announce three new metal workers machines as follows: double lock pipe rolling machine; cutting and edging machine; Maplewood gang punch. The double lock pipe rolling machine can be supplied to form any shape in metals from 24 to 30 gage and will turn out 80 feet of pipe a minute with locks on both sides made in one operation. The lock is formed up to the bead line. The cutting and edging machine cuts and edges both regular or irregular shapes in one operation. The gang punch is designed to be interchangeable to any spacing required with stripper and die constructed in one piece. The machine's capacity is ten $\frac{29}{64}$-inch holes through 18-gage steel. The machine will punch 1,000 sheets, both sides, in three hours time.

R&B Salesmen tell you a few things about the SUPERIOR TYPE "A"

RICHARDSON and BOYNTON Co.

244 Madison Avenue, N. Y. C. Branch Offices in Principal Cities.

New Products . . . . . .

13—Fan Blade

The Torrington Manufacturing Company, Torrington, Connecticut, announces a patented propeller fan blade of unique construction and attractive appearance which embodies entirely new principles in the art of fan design.

It is claimed that its operation is quieter than any other design having comparable performance characteristics. So far the fan has been built in 10, 12 and 16-inch sizes. Other sizes will be added. The blade will be known as the "Airistocrat."

◆

● 14—Closet Furnace

A new type gas heating furnace, known as type FAU and designed so that the unit can be installed in a closet or furred-out space, is announced by Payne Furnace & Supply Company, Beverly Hills, California.

The unit consists of a cabinet approximately 86 inches high, 21 inches wide and 23 inches deep; the width and depth varying according to the size of the furnace. The lower portion of the cabinet contains the outlet, motor and fan. The middle compartment of the furnace contains the combustion chamber of the gas burning furnace. The radiator section of the gas furnace occupies the top portion of the cabinet. Cold air from the house is taken in through pipes at the top of the furnace, passes over the radiator and then out the bottom. Several furnaces may be installed in a house, thus reducing the amount of duct work required and supplying zone operation by means of more than one furnace. The furnace is shipped in two sections. The furnaces are rated 995 to 1,990 C.F.M. free air delivery and will take from 90,000 to 180,000 Btu. input.

◆

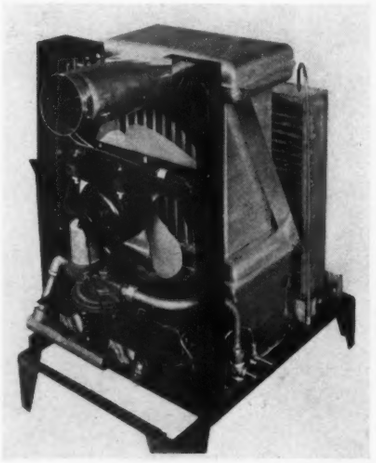
15—Filter

Independent Air Filter Company, 215 West Ohio Street, Chicago, Illinois, announce "Hair-Pad," a low cost air filter claimed to have high efficiency with low resistance. The filter is of the replacement type and comes in a metal frame. The pad is thrown away when the filter has become filled with dirt.

16—Floor Heater

The Trane Company of La Crosse, Wisconsin, has announced the new Floorflo Heater, for which are claimed 85% heating efficiency, complete automatic control, reduced fuel bills, delivery of heat to the living zone with a consequent low ceiling temperature, ease of installation, and positive safety.

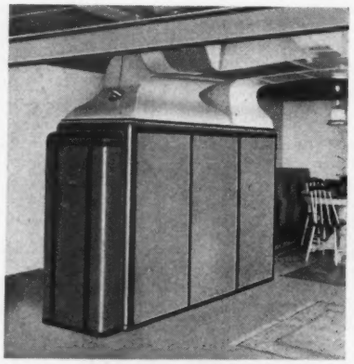
The working parts consist of an all aluminum heat exchanger, burners, a safety pilot control valve, gas pressure regulator, and automatic supply valve, fans, motors, solenoid control valve, and a limit control switch which automatically cuts off the gas supply in the event of overheating from any cause.



◆

17—Conditioners

The Nu Way Corp., Rock Island, Illinois announces a new oil-fired winter conditioner and summer air circulating furnace. The heating unit is a flange type Nu Way "Genii" oil burner mounted on a removable fire box which has the firepot built in at the factory. The heat exchanger is designed so that fire travel is through five flues. The forced air fan circulates the air through these flues. Dry air filters are used with a controlled humidifier.

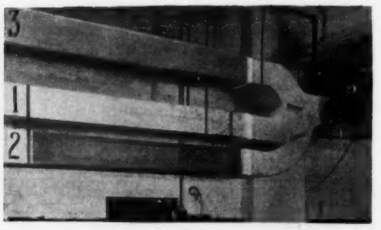


△ 18—Air Ducts

A new type of air duct was recently introduced by the Zonolite Corporation, Detroit. The duct is built up of wire mesh of a special weave to which is applied Zonolite air-duct insulation, which is a thermal and sound insulation of high efficiency. This application makes a solid covering with low thermal conductivity. At the same time no sound-absorbing liner of any kind is necessary as the Zonolite cover absorbs the noise through the mesh openings.

Zonolite is a micaceous, non-ferrous, granular material which, when expanded under high temperatures, takes on a leaf-like form and a bright golden color. Its insulating value is due to the fact that it has both a cellular structure, which resists heat conduction, and bright reflecting surfaces, which check radiation. Tests have shown its thermal conductivity to be only .27.

In tests for vibration these ducts showed no tendency to part company with the wire-mesh of the duct and an ability to stand high air pressures.



Tests have also shown about 5% more resistance to the flow of air than through an unlined sheet-metal duct.

The distribution plan followed by Zonolite Corporation is to license carefully selected sheet metal workers to construct the mesh ducts, to which the Zonolite thermal and sound insulation is then applied by specially trained employees of the corporation.

◆

19—Motor

A single-phase motor said to possess the smooth torque-speed curve, efficient starting features of the repulsion motor, and the approximately constant-speed load operation of the induction motor is announced in the Emerson SR single-phase motor. At the present time, 1725 r.p.m. motors have been developed in the following ratings: 1, 1½, 2, and 3 hp.

The motor has an armature with both a squirrel-cage winding and a repulsion or commuted winding. Both windings operate as such at all times; the commutator of the repulsion winding is not short circuited as the motor attains speed and the squirrel cage is not opened at slow or starting speeds.

The motor characteristics make it suited for such application as air compressors, commercial refrigerators, pumps, grinders, choppers, mixers and other devices which may offer a heavy starting load or in which starting is greatly prolonged because of excessive friction.

permanent economy with copper

HUSSEY

Permanent economy with copper is not merely a selling point when you are talking about HUSSEY Copper. It is a fact which is growing easier every day to prove to your customers.

The days of "buying for price" are on their way out and people as a whole are now purchasing materials they **know** will give them lasting satisfaction and economy. Copper installations always return a better profit on jobs, besides making fabrication and erection much easier.

Go after those jobs "hanging fire" in your neighborhood **today.** Satisfy your customers and yourself by specifying HUSSEY Copper on all places where metal might be used. You can specify HUSSEY Products and know that instant delivery is possible from any of the seven conveniently located warehouses. Specify **copper** for **permanent** economy and when you do, be sure it's HUSSEY COPPER.

DISTRICT SALES OFFICES

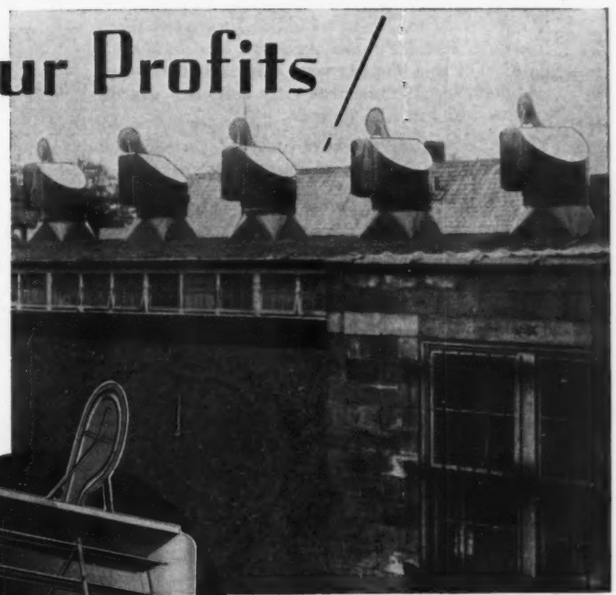
BALTIMORE	CLEVELAND	PHILADELPHIA
BUFFALO	DALLAS	PITTSBURGH
CHICAGO	NASHVILLE	ST. LOUIS
CINCINNATI	NEW ORLEANS	SAN FRANCISCO
	NEW YORK	

WAREHOUSES

CHICAGO	CLEVELAND	PITTSBURGH
CINCINNATI	NEW YORK	ST. LOUIS
	PHILADELPHIA	

C. G. HUSSEY & CO.
PITTSBURGH • PENNA.

Building Up Your Profits



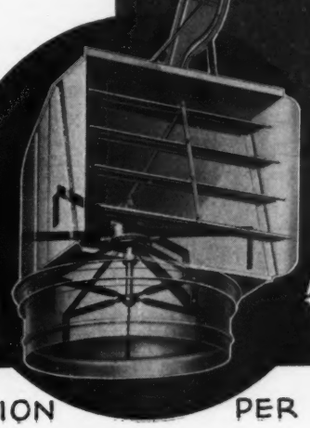
Profits in your sales are not only the dollars and cents immediate return on making each sale, but also the building up of customer goodwill and satisfaction which accrues to your benefit year after year—if you handle products of absolute dependability, long life, and efficient results.

In the ventilation field it's the Swartwout Rotary—the ventilator with 25 years reputation for quality and outstanding performance back of it.

To recommend and install this ventilator is like earning interest on your efforts, because it is going to pay you in prestige for years and years to come.

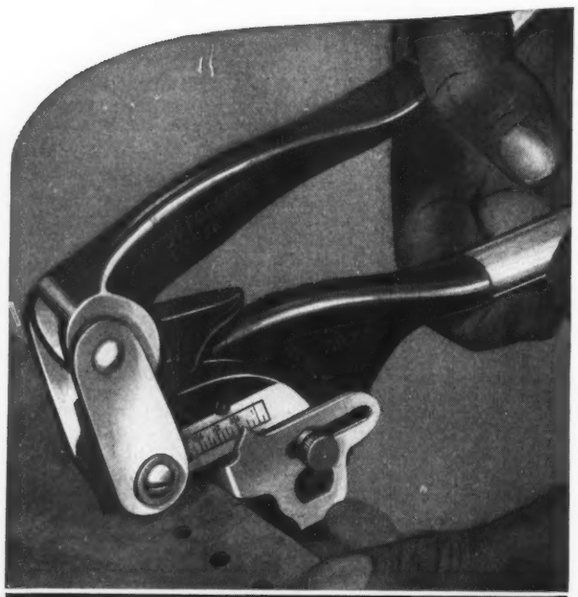
Let Swartwout increase your business this year—write for catalog.

The Swartwout Company
18615 Euclid Ave.
Cleveland, Ohio



Swartwout ROTARY BRONZE BALL BEARING **Ventilators**

MORE ACTUAL VENTILATION PER DOLLAR INVESTED



HYRO No. O.X. METAL PUNCH OUTFIT

Most Powerful of its Size!

It's a Powerful Work-Saver, too

You can punch holes as large as 1/64 inch in metal up to 14 gauge with the Improved Hyro No. O.X. Metal Punch. And you can do it with ease! Yet this Tool is very convenient to carry and handle. It measures only 8 inches overall and weighs but 2⅝ pounds.

Think how often you could use this fine Punch . . . how much time and labor it would save you. In a short time it would return the small investment of $5.90 (F.O.B. N.Y.) which buys not only the long famous Hyro Metal Punch . . . but a set of 7 Punches and 7 Dies, fitted in a sturdy steel case.

In the last year over 8000 sheet metal workers have taken advantage of this big value. You can get yours from a nearby supply house, or by mailing the coupon below.

$5.90 (F.O.B. N.Y.)
Buys this Complete Outfit

PRODUCT OF

PARKER-KALON CORPORATION

Parker-Kalon Corp., 200 Varick St., New York, N. Y.

Have nearest jobber ship me a HYRO No. O.X. Punch Outfit at the $5.90 (FOB, N. Y.) price.

Name.....

Address.....

Parker-Kalon Products Are Sold Only By Recognized Distributors

News Items . . . . . .

Home Building Costs Vary

It costs the buyer of a home nearly half again as much in one section of the country as it does in another to build the same identical one-family house, according to the Federal Home Loan Bank Review. The same home that can be erected in Columbia, South Carolina, for only $4,337 would cost as much as $6,442 in Providence, Rhode Island; Baltimore $5,028, or $6,033 in Cumberland, Maryland, only 125 miles away.

Recognizing the vital influence of construction costs on the volume of home building and the activity of mortgage lending operations, the Board is developing the first exact index ever attempted to cover the local trend of cost of small home construction in every part of the country, represented by actual data in some 70 cities. Current costs of materials and labor will be included, and the rising or falling trend thus disclosed at three-month intervals for the guidance of prospective home owners and the executives of home-financing institutions.

◆

Memphis Firm Active

Dixie Sheet Metal Works, 496 South Main St., Memphis, Tenn., headed by B. Crandall, is one of the most active firms in the sheet metal trade in the city. The firm displays warm air furnaces, air conditioning equipment, blow pipe work fans and spires for churches. Mr. Crandall says that trade shows some improvement and the firm has had several good roofing contracts in Memphis and lately completed the sheet metal work on an Army and Navy Hospital in Arkansas.

◆

Air Conditioning Preferred by Owners of Higher Priced Homes

In forecasting that air conditioning will some day be as common as modern heating in America, House and Garden Magazine used a coast-to-coast survey which showed an extraordinarily high immedate interest in air conditioning today among the better-class home owners who are the first to try out new home improvements.

Of those who answered the questionnaire almost five out of ten are planning to build or buy or remodel in the near future. Of these, a little over four per cent already have complete or partial air conditioning in their present homes, and virtually 80% expressed an immediate interest in air conditioning. Of the homes planned by these better-class readers, 23.6% will cost from $15,000 to $40,000 and over. 48.3% will cost from $7,500 to $15,000. And 28.1% will cost under $7,500—this last figure including some summer cabins and cottages. They will range from four to twenty rooms in size (average size 8.2 rooms) and will have an average of two and half bathrooms each.

A sharp preference was shown for hot water and warm air heating, in contrast to steam and vacuum vapor. Of the families planning to buy or build new homes, 41% prefer hot water heating; 38.8% prefer warm air; 13.1% steam and 10.3% vacuum vapor. More than half (53.5%) prefer oil as fuel, with gas a close second (40.7%) and stoker-fed coal third in preference (10.2%).

◆

Manufacture Metal Culvert

The Tennessee Metal Culvert Co. established in 1908 in Nashville, Tenn., is one of the oldest manufacturers of corrugated metal pipe in the upper south. The firm now operates plants at Nashville, Knoxville and Memphis. The Nashville and Memphis plants carry a complete stock of all sizes of pipe. Among the many well known customers are Tennessee Valley Authority, Smoky Mountain Park and the National Forests Departments. Several contracts totaling 25,000 feet of Armco dredge pipe have been furnished recently for the construction of Pickwick Landing dam. The company also handles spiral welded pressure pipe used for water, oil and gas lines.

News Items . . . . . .

Brownsville Firm Active

Coltart Sheet Metal Works, Brownsville, Tenn., does a line of roofing and general sheet metal work in Brownsville and Haywood county. The business was established several years ago and is one of two firms of the industry in Brownsville.

◆

Chicago Tribune Retracts Heating Recommendations

In the Chicago Tribune of November 5, under the section called "Friend of the Coal User," a reader asks: "I am interested in either hot water or furnace heat for six rooms. Will you please inform me which heat is cleaner and which is the most economical?"

The Tribune replied as follows: "A hot water heating system is cleaner than a hot air furnace, as it does not carry dust. It will increase the value of your property much more than a hot air system and its fire risk is less. The cost of operation is approximately the same for both systems."

A. W. Wrieden, Secretary of the Warm Air Furnace Manufacturers' Institute, Holland, Michigan, protested this favoritism toward hot water heating and as a result secured from the Tribune the following retraction: "In reply to several letters from manufacturers of both hot water and warm air heating systems who asserted that a recent reply in this department to the query regarding the relative cleanliness of the two methods was incorrect, we are glad to publish some of their comments.

A maker of both kinds of heaters says: "A warm air furnace installation is, under the same operating circumstances, cleaner than a hot water or steam radiator job; in fact, by the use of filters it can be made to deliver warm air into the rooms to be heated without a trace of dust, regardless of the amount that is forced in on the opposite side of the filter.

"The statement that hot water heat would increase the value of the property is debatable and certainly there is no more fire risk with one than the other, while the cost of operation for warm air is very decidedly less than the cost for hot water in a six-room residence."

◆

Contractor Does Blow Pipe Work

G. R. Maples Sheet Metal Works, Meridian St., Huntsville, Alabama, does a very complete line of roofing, heating, ventilating and blow pipe work in this important cotton and milling section. The cotton mills in Huntsville with one exception are all active and trades in all lines expect a very good year.

◆

A. G. Maas Retires from Business

A. G. Maas, Blue Earth, Minnesota, writes that because of failing eyesight he has practically retired from active work in warm air heating, sheet metal work and hardware sales. Mr. Maas has been a long-time reader of AMERICAN ARTISAN and we regret very much to hear that he no longer finds it possible to continue in business.

◆

Handles All Types of Heating

Fischer Plumbing and Heating Co., 367 Adams Ave., Memphis, Tenn., headed by John Fischer is one of the oldest and most active firms in the heating trade here. It covers all branches of heating—furnace, steam, hot water, etc. It also is a distributor for the Iron Fireman coal stoker and has a beautiful show room. The firm was located for a long period on South Second, but several years ago erected its own modern home in the up town section of Adams street.

HYRO SHUR-GRIP SOLDER IRON HANDLE

A Handle that makes any Iron BETTER

Screws on — Stays on — Keeps Cool

Put a Shur-Grip on any solder iron and you have a real tool that is handy and comfortable to use . . . one that gets a soldering job done quicker and better.

A Shur Grip is made right. See the cut-away view below. A unique die locked in the handle cuts threads on the solder iron stem when screwed on. This absolutely prevents the handle from coming off. Also it eliminates the task of burning a stem into a handle.

This "screw on" feature, and a special vent hole keeps the handle cool, too. It can't get hot or char because the stem does not touch the wood. Comfort is also assured by its perfect shape and balance and shoulder that prevents burned fingers. Three sizes fit all irons from 1½ to 12 lbs.

A FREE HANDLE TO TRY

Send 10 cents in stamps to cover mailing cost and we'll give you a free handle so you can see its advantages.

PRODUCT OF

PARKER-KALON CORPORATION

Parker-Kalon Corp., 200 Varick St., New York, N. Y.

I enclose 10 cents in stamps to cover mailing of the free Shur-Grip Solder Iron Handle.

Name.....

Address.....

Bright Metal

(*Continued from page 20*)

shear edge. It is recommended, therefore, that all stainless sheets be sheared individually.

Manufacturers of stainless steels say that about twice the power is needed to shear bright metal as compared to mild steel sheet. For foot power there will be, then, a limit to the gauge of material which can be cut in the machine. For power shears with sharp knives, the requirement of twice the power offers little difficulty excepting that any given capacity of shear rated for mild steel will not cut as heavy a stainless steel sheet. In power shears, also, careful attention should be paid to the kind of blade, as the work hardening of the metal when turned over the lower cutter by a dull blade will not stop the shear, but will result in a much higher power cost. This added cost can be saved if proper preparation of the machine is insisted upon.

It may be of interest to note here that numerous users of light gauges of stainless do not try to set the blades of the shear any closer than used for equivalent gauges of mild steel, but these users do recommend that the carbon steel blades commonly employed be replaced by a harder blade which does not require such frequent sharpening and which, they say, increases production speed tremendously. Also such harder blades insure a cleaner cut along the edge.

Stainless steel sheets should be sheared in a machine which has at least an inch of free blade travel beyond the end of the sheet. The reason, of course, is that the sheet must be cut completely through and some free travel is necessary.

Michigan Convention

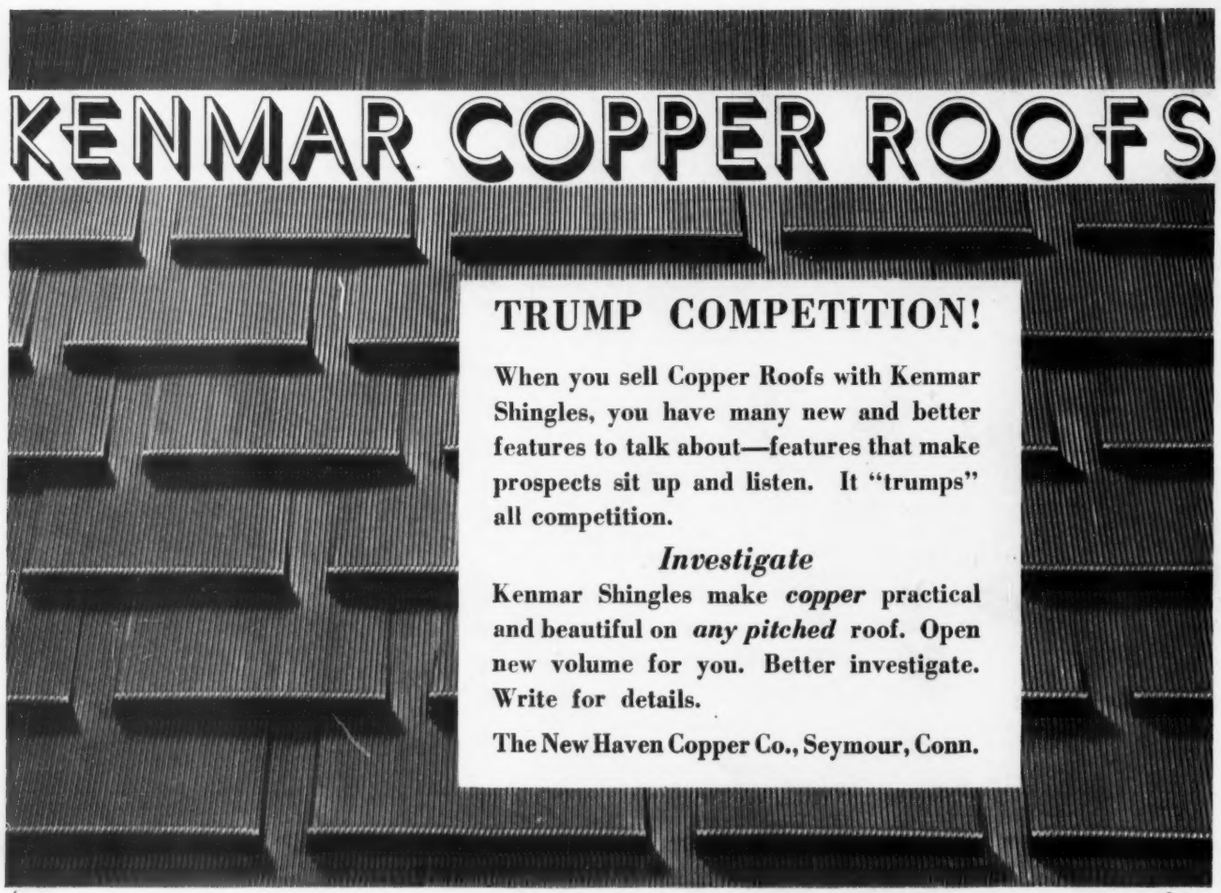
(*Continued from page 21*)

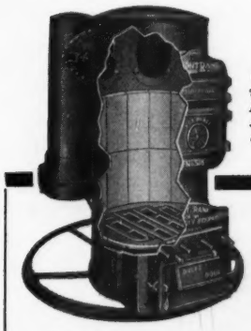
by a 1 per cent payroll tax beginning as 1 per cent in 1936 and increasing ½ per cent a year until 3 per cent. This tax covers every size of establishment.

The unemployment tax started in January, 1936 as 1 per cent and increases 1 per cent a year until it reaches 3 per cent. Every employer of 8 men or more and where the 8 men worked any 20 weeks during the calendar year must pay. The employee pays a similar amount. If any state has an approved state unemployment law the money is returned to the state (90 per cent) for state disbursement, but where no state law exists the money goes into the general funds of the Federal treasury and is paid out on demand by the state boards.

Ernest P. Condon of the Michigan State Tax Commission explained why a state sales tax is necessary to meet the severe financial demands of schools and institutions and declared that he felt a sales tax was the most equitable form of tax for everyone pays in accordance to what he spends.

He explained that several reversals have been made for the sheet metal and roofing industries and for other building crafts and that at present the industry is not asked to pay any sales tax. He expressed as a personal opinion that abolishment of all sales tax on materials and supplies used by the construction industry is not unlikely as a stimulus for construction.


KENMAR COPPER ROOFS
TRUMP COMPETITION!
When you sell Copper Roofs with Kenmar Shingles, you have many new and better features to talk about—features that make prospects sit up and listen. It "trumps" all competition.
Investigate
Kenmar Shingles make copper practical and beautiful on any pitched roof. Open new volume for you. Better investigate. Write for details.
The New Haven Copper Co., Seymour, Conn.



Cut-a-way view of FRONT RANK furnace showing steel construction.

HEATING FRONT RANK SYSTEMS

TRADE NAME REG. U.S. PAT. OFF.

LINE UP WITH LIBERTY

Both you and your customer benefit when you sell him either a FRONT-RANK or a MELLOW Furnace. Your customer gets a superior furnace to suit his exact needs at an attractive price, and you make a substantial Profit.

Equipped with either round or square casings in gravity or forced air types. Manual or automatically controlled, and can be adapted to oil, gas or hand firing, as your customer wishes.

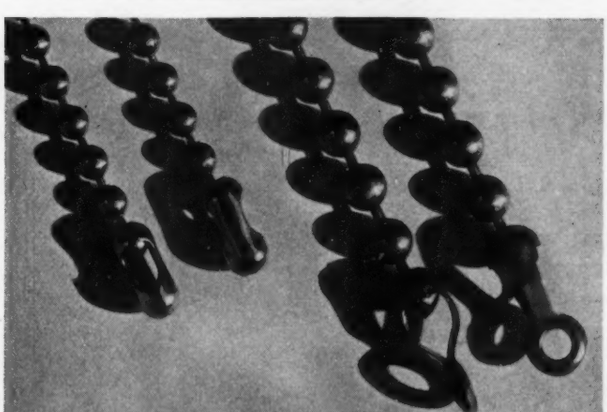
Investigate this complete line of furnaces. Write today for literature and dealer proposition.

LIBERTY FOUNDRY COMPANY

St. Louis, Missouri

MELLOW WARM AIR FURNACE

MELLOW Furnace without Casing. Note solid cast construction throughout.



BEAD CHAIN*

This non-kinkable, smooth running chain, of swiveled metal beads, improves every job —in appearance and service. It is ideal for ventilator, skylight, heat control and other regulators. In standard sizes, metals and finishes, with couplings and pendants for many uses. Ask your jobber.

•

THE BEAD CHAIN MANUFACTURING CO.

*TRADE MARK REG. U. S. PAT. OFF.

BRIDGEPORT, CONN.

You Can Cut THESE 15 Feet Per Minute

WITH

STANLEY UNISHEARS

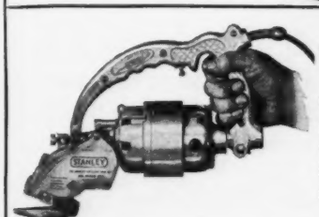
Sheet Materials
Galvanized Iron
Brass
Copper
Tin
Aluminum
Stainless Steel
Armco Sheets
Fibre
Wire Lath
Hardware Cloth
Screen Wire
Asbestos
Canvas
Felt
Linoleum
Black Iron
Blue Annealed Sheets
Paper, etc.

Any pattern, straight or curved, is as easy to cut as it is to lay out, if you have a Stanley Unishear. Safe —no chance to cut yourself. Follows a line perfectly. Leaves smooth, finished edges.

NEW!

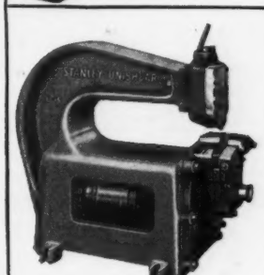
No. 16

A light tool with a heavy capacity—up to 16 gauge H. R. steel. Easy to handle, sturdily built, 100% safe, it plugs in any light socket and handles continuous production work. Minimum radius 1½". Universal motor.



"MIGHTY MIDGET"

Capacity—18 gauge hot rolled steel. A light, handy tool for countless jobs. Minimum radius 1". Universal motor.



STATIONARY UNISHEARS

The O Type Stationary Unishears have a capacity up to 14 gauge hot rolled steel. They will start holes *inside* a sheet, without cutting in from the edge. Cut curves to less than ¼" radius, speed 15 feet a minute. Three sizes: No. O-15 with 15" throat; O-36 with 36" throat, and O-54 with 54" throat.

Other Unishear Models to cut up to ¼" boiler plate. Complete descriptive literature on request. Your Industrial Distributor will gladly demonstrate these to you.

STANLEY ELECTRIC TOOL DIVISION

The Stanley Works New Britain, Conn.

For Fast Cutting . . . **STANLEY UNISHEARS**

Upjohn Ventilating

(*Continued from page* 19)

lished a complete field shop inside the plant. Sheets were purchased as nearly to width and length as possible and were delivered directly to the field shop.

Preliminary layouts for duct sections were made from the blue prints, but these measurements were verified in the building to eliminate, so far as possible, all cutting and fitting when erecting. Generally, all straight pipe was cut and formed in 8-foot lengths, with variations for elbows, bends and turns as required.

Locks

On all the larger sizes, the ducts were fabricated as two sides, a top and bottom section with Pittsburgh locks. Assembly was made on the building floor, usually assembling the two sides, then the top and bottom, and when assembled the section was raised to the working scaffold and hung by the crew. On the deep ducts, standing seam drive cleats were used on all four sides. On smaller ducts the drive cleats were used on the top and bottom and "S" drive cleats for the two sides.

Usually the duct sections were not cut for branch takeoffs until after the section was hung in place. Then the opening was spotted and cut and the prepared branch connected. A detail of interest is the use of one long side piece for several shorter top and bottom sections. Where this practice was employed, the standing seam drive cleats provided needed stiffening while the long side piece reduced the number of cleats required, and made for a smoother appearance.

Insulation

Because the ducts run for long distances from washer to outlets, it was considered advisable to insulate all metal work to conserve air temperature. One of the details shows the insulating construction employed. The Celotex was bought in length of 8, 10 and 12 feet, in suitable widths. Upon application, the Celotex was cut so that each sheet just filled the space between standing seams.

To hold the insulation in place, the top sheet was first laid on the duct. Then the two sides were held in place by the mechanics while a pre-formed metal angle was laid along the horizontal corner. The top of the angle kept the angle from falling off and nails were driven along the side of the angle to hold up the Celotex side sheets. With the top and sides in place, the bottom Celotex was then held in place while another angle was nailed along the bottom edges of the side sheets.

Steel Straps

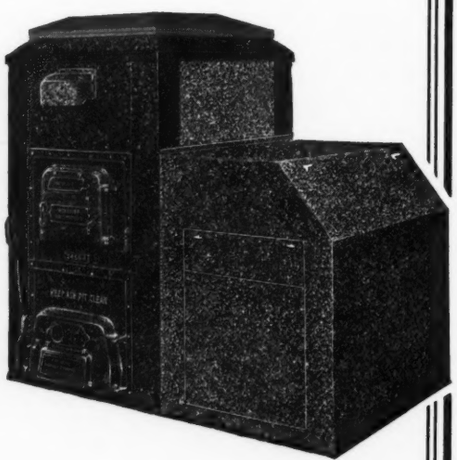
The contractor made use of steel box strapping to make a tight job. The ½-inch steel straps were passed around the duct and the fastening machine then pulled the strap tight and clipped the two ends together. Usually one strap was used near each end, but in long sections a third strap was added at the center point. This excellent method of applying insulation increased the speed with which the insulation was applied and provided a neat appearing and exceedingly tight installation.

ARE YOU
KEEPING PACE WITH 1936?

This is the year of improvements. Home Owners who have been wanting better things are now going to realize them. Old heating plants will give place to new or, better still, to air conditioning systems.

Take on the complete Moncrief line and you can meet any demand. It affords you every advantage in variety, design, quality and price. With it you can supply any and every need in home heating and air conditioning.

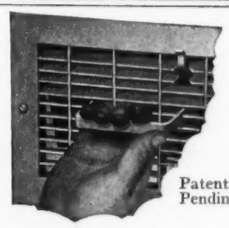
Send for particulars of the Moncrief Proposition.



The Henry Furnace & Foundry Co.
3473 E. 49th St. Cleveland, Ohio

Manufacturer of

MONCRIEF FURNACES
AND AIR CONDITIONING SYSTEMS FOR
COAL — GAS — OIL



Patent Pending

You Can Direct Air Flows with Certainty

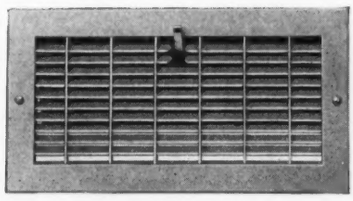
with INDEPENDENT "Fabrikated" Adjustable Directed Air Flow

REGISTERS and GRILLES

Grille bars may be adjusted—before or after installing—to direct air flows to any angle as much as 45 degrees. Made in any size, any finish.

THE INDEPENDENT REGISTER CO.
3741 E. 93D ST. CLEVELAND, OHIO

Send for catalog and data book.



RYBOLT

THE FURNACE OF THE FUTURE *NOW!*

MAKE the most of the opportunities for bigger and better installations offered you during 1936 . . . and do it in the right way. Handle RYBOLT! The new RYBOLT furnace, supplied in either cast-iron or steel, embodies every well-established, high-grade feature of furnace design and construction. Clinch your sales talk and assure your customers of clean, trouble-free heat by driving home the 14 construction features which put the new RYBOLT far, far ahead of competition.

In the cast furnace a one-piece radiator, duplex grates, heavy cast front and waist-high grate shaker are just a few of those 14 separate, distinct features in the new RYBOLT which will build you a reputation as a good furnace man. Write for literature and sales helps today. Scoop your competition and build up an irresistible sales line with the new STEEL or CAST RYBOLTS.

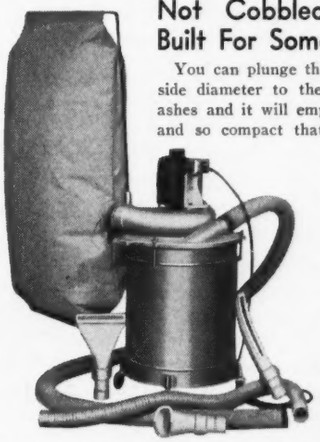
The new RYBOLT Furnaces have become the reigning sensation of the trade. They are real sales getters and furnaces that will give the owner lasting satisfaction.

The Finest Furnace Ever to Bear the Rybolt Name

RYBOLT HEATER CO.
ASHLAND, OHIO

the GRAND RAPIDS FURNACE CLEANER

Is Made Expressly For Heating Men. It Is Not Cobbled From A Unit Built For Some Other Purpose.



You can plunge the hose which has a 2" inside diameter to the bottom of a big can of ashes and it will empty it. It is sturdily built and so compact that it can be carried about the house or in any car with men and tools without special arrangements.

"A Plan to Increase Your Sales" goes with the machine which is not an arm chair theory but the outcome of successful experience.

CONVENIENT TERMS—UNBELIEVABLY LOW PRICE—OUR FREE TRIAL WITHOUT COST OR OBLIGATION TO YOU WILL PROVE OUR STATEMENTS.

Write for details

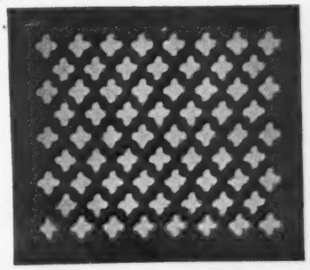
GRAND RAPIDS FURNACE CLEANER COMPANY
Grand Rapids, Michigan

PERFORATED METALS

ARCHITECTURAL GRILLES

In Bronze, Steel, Stainless Steel, Monel, Aluminum, and other metals. Grilles of distinction for fine buildings in a wide variety of attractive designs. All of the standard and many original and modern designs are available in any metal, and of all dimensions, carefully made from selected stock. Grilles are but one of our specialties. We make Perforated Sheets of every type.

Pleasing Prices, Prompt Service



50 Years Experience Perforating Metals

The Harrington & King PERFORATING CO.

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

Minneapolis Code

(*Continued from page 22*)

Motors shall be mounted in such manner that vibration will not be transmitted to duct work or equipment.

Electrical conduit and water piping shall not be fastened to, nor make contact with fan housing.

Section 1212. Summer Air Cooling Equipment; Basis for Design of: Cooling equipment installed in connection with a warm air all year air conditioning system shall have a cooling capacity not less than that determined in accordance with the following design requirements:

1212.1 Outside Design Temperature and Relative Humidity: The design dry bulb and wet bulb shall be not cooler than 93° F. dry bulb and 74° F. wet bulb. Approximately 40% relative humidity.

1212.2 Inside Design Temperature and Relative Humidity: The assumed inside design temperature and relative humidity shall be not more than that set forth in the following table for the type of occupancy which may apply. Type "A" shall be for continuous occupancy. Type "B" shall be for approximately 3 hour occupancy. Type "C" shall be for occupancy of 1 hour or less.

TABLE No. 28
INSIDE DESIGN TEMPERATURES

Occupancy	Dry Bulb	Wet Bulb	Relative Humidity	Effective Temperature
A	78° F.	67° F.	56%	73° F.
B	80° F.	68° F.	53%	74.5° F.
C	82° F.	69° F.	52%	75.5° F.

1212.3 Cooling Load, How Determined: The design coefficients for heat transfer through walls, roofs and glass areas and for heat gains from people and appliances shall conform to the standards incorporated in Chapters 1, 2, 5 and 8 of the 1935 edition of the American Society of Heating and Ventilating Engineers Guide, Volume 13.

1212.4 Infiltration and Air Leakage: In a cooling system so designed that a positive pressure is carried within the room or space to be cooled, the heat gain due to infiltration and air leakage may be omitted in design calculations.

PART XVII
VALIDITY, VIOLATIONS, PENAL AND EFFECTIVE CLAUSES

Section 1701. Validity: Should any sections, clause or provision of this ordinance be held unconstitutional or invalid by any court, all other sections, clauses and provisions shall nevertheless be deemed as effective as though such unconstitutional or invalid section, clause or provision had never been inserted in this ordinance.

Section 1702. Violations: The continued violation of any provision of this ordinance shall be and constitute a separate offense, under this ordinance, for each and every day such violation shall continue.

Section 1703. Penalty: Any person, firm or corporation who shall violate any provision of this ordinance shall be subject, upon conviction thereof, to a fine of not less than Ten Dollars ($10.00) nor more than One Hundred Dollars ($100.00) for every offense, or, upon failure to pay such fine, to imprisonment not exceeding ninety (90) days.

Section 1704. Repeal of Previous Ordinances: The following ordinances and all amendments thereto, except as indicated, are hereby repealed:

That certain ordinance entitled, "An Ordinance Relating to and Regulating the Construction and Installation of Oil Burning Devices and Equipments for Heating Purposes and the Storage and Use of Fuel Oils in Connection Therewith in the City of Minneapolis, and Providing for the Licensing of All Persons Installing Such Devices and Equipments in Said City," approved February 4, 1931, as subsequently amended, except Section 1 of said ordinance and the penal clause enforcing the same.

That certain ordinance entitled, "An Ordinance Regulating the Construction, Installation and Alteration of Warm Air Heating Furnaces and Plants within the City of Minneapolis," approved March 24, 1926, as subsequently amended, except Section 1½ of said ordinance and the penal clause enforcing the same.

Section 1705. This Ordinance to Take Effect, When: This ordinance shall take effect and be in force from and after its publication.

Passed June 28, 1935. O. A. Pearson, President of the Council.

Approved July 2, 1935, Thomas E. Latimer, Mayor.

Attest: Chas. C. Swanson, City Clerk.

You Multiply POUNDS of Foot Pressure Into TONS with these New NIAGARA

—Foot Operated—

SQUARING SHEARS

Sheet metal workers are amazed at its new, easy foot operation. Specially designed treadle mechanism multiplies pounds of foot pressure into tons.

Modern Closed Panel Housings
Self-Locking Steel Holddown
Visible Cutting Line
Steel Crosshead
Niagara Alloy Steel Knives
Complete with front, Side, Bevel and Back Gages

Send for Bulletin 80A

Mail Coupon for Bulletins Covering Niagara Machines and Tools

Capacities:
16 gauge up to and including 72 inch cutting lengths.
18 gauge on 96 and 120 inch cutting lengths.

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y.
Please send complete description of Series F Shears and items checked below:

☐ Foot Gap Shears
☐ Groovers
☐ Slip Roll Formers
☐ Power Squaring Shears
☐ Shears; Squaring, Rotary
☐ Lever Shears & Punches
☐ Machines for Turning, Wiring,
☐ Beading, Burring, Flanging

Name .....

Street .....City.....AA3

"370 SPECIAL"
RED OXIDE ROOF PAINT

The Standard of Quality

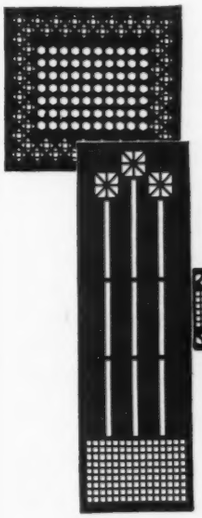
Sold only through recognized Sheet Metal Jobbers

Lyon, Conklin & Co., Inc., Baltimore & Washington
Stichter Hardware Co., Reading, Penna.
The J. M. & L. A. Osborn Co., Cleveland, Detroit, Buffalo
Rockford Sheet Steel Co., Rockford, Ill.
Arnold Supply Co., Birmingham, Ala.
Herr & Co., Lancaster, Penna.
Follansbee Brothers Co., Pittsburgh, Pa., Rochester, N. Y.
Eagle Roofing and Art Metal Works, Tampa, Fla.
The Moise Steel Co. of Ohio, Cincinnati, O.
Vorys Brothers, Inc., Columbus, O.
McClure-Johnston Co., Pittsburgh, Pa.
Demmler Bros. Co., Pittsburgh, Penna.
F. D. Mitchell, Albany, N. Y.

Manufactured by

THOMPSON & COMPANY
Since 1847

P. O. BOX 6757 PITTSBURGH, PA.



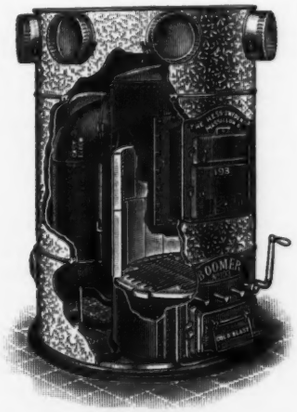
WISSCO PERFORATED METALS *in* *Combination Designs*

Send for the new folder WISSCO DECORATIVE PERFORATED METALS. It will be of interest and value to you.

The thousands of Wissco Stock Dies are only the media of expressing original ideas in perforated metal designs. By indicating the arrangement of stock units you have available endless possibilities of unique patterns at nominal prices.

WICKWIRE SPENCER STEEL COMPANY
41 East 42nd St., New York City
Worcester Buffalo Chicago San Francisco

WICKWIRE SPENCER perforated metals



Boomer Boiler Plate Furnaces

Also made with duplex grates and upright shaker.

Have been successfully made for 23 years. Where introduced have given satisfactory service. The fire pot liners are the best we can buy and we know of several Boomers that still have the original liners in, which are 23 years old. We have been making cast iron Boomers for 50 years.

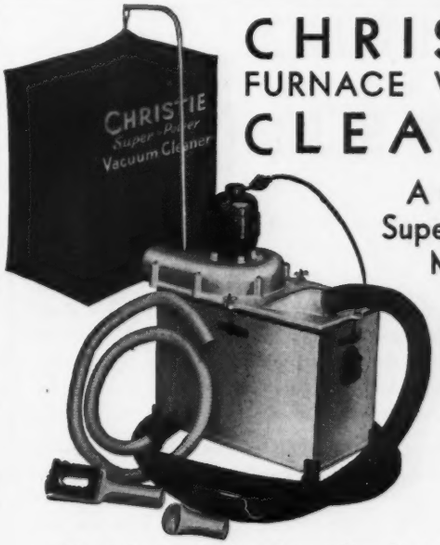
If you are interested in selling a strictly high grade furnace, ask for prices and agency.

Nothing but the best of material enters into the making of Boomers.

When repairs are needed, avoid risk of dissatisfaction by ordering direct from the original patterns. Prices are low.

We sell to legitimate dealers only.

THE HESS-SNYDER CO., MFRS.
Massillon, Ohio



CHRISTIE FURNACE VACUUM CLEANER

A One-Man Super-Powered Machine

$99.50

(Subject to Change Without Notice)

F. O. B. Cincinnati with Tools and Attachments

This is the same high quality machine that is known to furnace dealers everywhere as the most powerful, one-man cleaner on the market. Built by practical furnace men.

Quantity production and large purchasing power enable us to make this sensationally low price. Includes tools and attachments. Folder "A" mailed upon request.

We also manufacture the "Christie Giant" to operate from truck or yard.

Sold by Jobbers and Furnace Manufacturers.

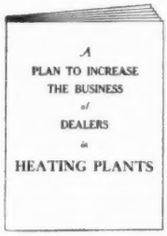
DISTRIBUTORS WANTED: Write for interesting proposition.

CHRISTIE CLEANER COMPANY
Division of The Cincinnati Sheet Metal & Roofing Co.
226-30 East Front St. Cincinnati, Ohio

MORE SALES BIGGER PROFITS

If you can get to the basement you can sell!

Cleaning heating plants still offers the quickest and cheapest—and about the only—approach to the home-owner who needs (but doesn't know it yet) a new heating plant—new grates—new firepot.



There's nothing complicated about it. This Plan Book, free on request, shows you HOW to get hundreds of cleaning jobs—how to build up a real service at a real profit to you. Everybody who ever tried this plan always did increase his sales and his profits.

THE NEW HIGH QUALITY LOW PRICED SUPER RED STREAK CLEANER

Since commercial cleaning of heating plants by vacuum began, the Super has led the field in furnishing the strongest, most complete, lowest upkeep-cost cleaner ever made.

Records on machines used hard from five to seven years show monthly upkeep cost—including all parts and repairs—of 33 cents per month. One dealer, using 17 Supers, averages 49 cents per month upkeep but, based on the 6,000 cleanings he does per year, the upkeep PER CLEANING is 1 2/3 cents.

The new Super—at the LOW PRICE—has the same power—is built to give the same quick work at the same low upkeep cost.

------USE THIS COUPON------

The National Super Service Co.
1944 North 13th St., Toledo, Ohio

Send the Plan Book, and tell me about your free trial plan and the NEW HIGH-QUALITY LOW-PRICED SUPER that will increase my sales and profits.

Name .....

Street Address .....

City & State .....

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 84

214—Heat Calculator

Richardson and Boynton Company, New York City, announce the Richardson air conditioning calculator, a cardboard slide rule wherein square feet of steam radiation or hot water in place or the heat loss as calculated is placed in tabular form along side of the square inches of leader pipe required for gravity, the mechanical code room basic factor, an R & B special factor, the free area of register needed and size for high side wall register.

Windows in the calculator give C.F.M. required at 300, 400, 500 foot velocities for 120, 130, 140, 150 degrees register temperature plus the area in round pipe needed and the required C.F.M. Other tables convert round pipe to rectangular of equal friction and give area of round pipes. The purpose is to enable quick calculations of C.F.M. and pipe sizes without a pencil.

◆

215—Blower Bulletin

Peerless Electric Company, Warren, Ohio, announce a new bulletin No. 207 describing and giving details of the direct-drive and belt-driven blowers used for domestic air conditioning purposes.

◆

216—Sheets in Air Conditioning

Republic Steel Corporation, Cleveland, Ohio, announce a new small leaflet describing the advantages of corrosion-resisting Toncan Iron for air conditioning equipment. The leaflet explains the ductility and workability of this material and points out the many places where corrosion resistance is desirable.

◆

217—Catalog of Small Sheet Metal Tools

A four-page leaflet, containing illustrations and information on bar folders, ring and circle shears, combination folder and brakes, squaring shears, beaders, combination bench machines, roll formers, stakes, groovers, etc., is announced by Niagara Machine and Tool Works, 637 Northland Avenue, Buffalo, New York. Illustrations of the numerous items shown in the leaflet are presented together with descriptions.

◆

218—Fan Bearing Leaflet

Randall Graphite Products Corporation, 609 West Lake Street, Chicago, Illinois, announce a one-page leaflet showing exterior and cut-away views of the Randall double reservoir oil return, self aligning, self lubricating pillow block. This new pillow block has the same lubricating principles as the standard pillow block employing an upper and lower reservoir divided by cast iron ribs. Wool yarn is packed into the lower reservoir. The upper reservoir holds approximately fifteen cubic centimeters of oil and the lower reservoir approximately eleven cubic centimeters, a combined capacity sufficient for several months operation.

◆

219—Asbestos and Insulating Price List

Grant Wilson, Inc., 4101 West Taylor Street, Chicago, announces a new price list for furnace manufacturers and furnace supply jobbers. The company advises that several changes in the usual price sheet have been made in order to simplify its use. The price list shows a number of the products manufactured by the company, accompanied by information on sizes, weight, thicknesses, and discounts in carload and less-than-carload quantities. Among the many items listed are pipe covering, asbestos paper and board, millboard, boiler and furnace cements, paste, and pre-formed jackets.

"BB"

The mark of quality on sheet metal and roofers' supplies

BERGER BROTHERS CO.

229-237 ARCH STREET, PHILADELPHIA, PA.

EAVES TROUGH
GUTTER HANGERS
CONDUCTOR PIPE
CONDUCTOR FASTENERS
MITRES
END PIECES AND CAPS
CONDUCTOR HEADS
ORNAMENTAL STRAPS
VENTILATORS, ETC.

WHITNEY No. 4-B PUNCH

This punch for sheet metal work has a capacity of ¼-in. through 16 gauge. Weight 3 lb. Length 8½-in. Depth of throat 2-in. Complete tool includes three punches and three dies of specified sizes with die adjusting key.

THE WHITNEY LINE

In the W. A. Whitney line of Hand Lever Punches you will find a portable hand lever tool suitable for every requirement. They are made in ten sizes and types, ranging in size from the Tinners No. 4 Punch, which punches ¼-in. hole through 16 gauge iron to the No. 92 Punch, capable of punching a 2-inch hole through ⅛-in. stock. Each tool has its special field of work as recorded in our latest catalog.

WRITE FOR CATALOG

W. A. WHITNEY MFG. CO.

636 RACE ST. ROCKFORD, ILL

"All Records Broken"

means a Record-Breaking Opportunity

The coldest winter in weather bureau history, in most parts of the country. Day-after-day with heating plants "wide open" - - - every furnace man knows that means cracked and broken firepots in house after house, right down the street.

Here is opportunity—a chance of a lifetime to FIRELINE your town, to make literally hundreds of new customers, to sign up enough business to keep you humping all summer. If there was ever a time for door-to-door selling of furnace work *NOW IS THE TIME* . . . right now while the chill of winter is still felt. And if there ever was a "door opener" and a sales closer it's FIRELINE.

"Any fire pot repaired for $15 (and a $10 clear profit for you).

Repairs CRACKED FIREPOTS

"More *heating* capacity—less ashes, no smoke, soot or furnace gas and a big saving in fuel cost." It's the sales story hundreds are waiting to buy on. This is something you can't afford to pass up.

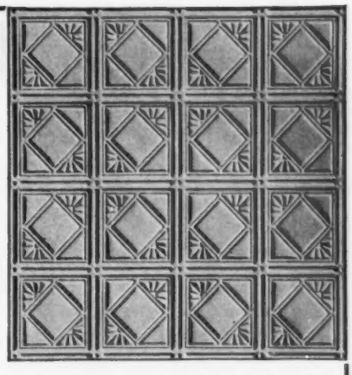
If you don't know the FIRELINE proposition in detail, write, wire or phone today for full details and free Sample.

Fireline Stove & Furnace Lining Co.
1866-C Kingsbury St. Chicago

Copr., 1936, Plibico Jointless Firebrick Co.

FIRELINE

BEAUTY VARIETY QUALITY



VARIETY—That's one point that will get you steel ceiling installations, and you can't get a better line of variety in ceilings than Canton offers. Of course beauty and quality are major points to be considered too, and when you handle Canton Steel Ceilings you know you have the utmost in beauty and quality. They offer a change from the dull, easily soiled and in most cases easily cracked and streaked plaster ceilings. They are permanent, indestructible. You can guarantee your prospect a ceiling to fit any type or style of installation and that there will never be a damage suit from falling plaster. Write for Canton Sales Helps and also the new Catalog F. They will further convince you that more profits lie right at your finger tips in the complete Canton line.

Sold through all leading Sheet Metal jobbers.

CANTON STEEL CEILING COMPANY

2280 WINFIELD WAY, S. E., CANTON, OHIO

Warehouse Service: 497 West St., New York City, and Canton, Ohio

Comebacks

(*Continued from page* 13)

When checking the original data, the date is also recorded on the comeback slip. It is not unusual to find three, four and even five years have tobogganed past. We do not question our customer's integrity; when he said "last year" he meant it, but he was sadly in error.

At the end of December, when it comes to figuring loss and profit for the year, to what can one actually charge these comebacks? A percentage of them did not yield a cent, but actually cost money. Very definitely these comebacks are an item of overhead and should certainly be figured as such.

Don't "Put Off"

Of all the mistakes we make none is so senseless nor so costly as the stupid "put-off-till-tomorrow" attitude many of us assume. For instance—

The phone rings. A voice asks, "Is this the Old Fashioned Roofing Co.?"

"Yes!" one promptly replies, "Mr. Kootz speaking."

"Well, Mr. Kootz, the roof you fixed six months ago still leaks," says a biting tone. "I had my room repapered and I wish you could see the great big spots all over. I wish you'd come up right away. When will you be here? My husband is furious. He paid your bill the next day." Then tactlessly the voice adds "I told him he should wait awhile."

"I've a job in your neighborhood. I'll be up in a little while."

That "little while" slips into days, weeks, months, in spite of frequent phone calls from Mrs. Customer that "something must be done."

Kootz, just like you and me, doesn't like to admit a fault. He reasons to himself "that woman is crazy. Why we went over that whole roof carefully. There is absolutely nothing wrong with it. She is just trying to get something for nothing."

Another Method

And right here, because Kootz can't swallow his pride and admit the possibility of an error, he and thousands of roofers like him throw away money.

"I've never lost money on a comeback," a large New York roofer told me. "It's a rule in my organization," he continued, "to have comebacks immediately attended to. It's a thrill to see the surprise on a new customer's face when we respond promptly within a few minutes after they complain. Comebacks take precedent over new work.

"But I am telling you it establishes confidence. After having had contacts with the shiftless sort our service is appreciated.

"Of course we don't fail to suggest that the roof needs painting, the gutters repairing or a chimney pointing up. The additional job helps pay for the comeback and we see that there is a little profit besides. Yes, we make money out of comebacks. Take care of your comebacks and your comebacks will take care of you."

and NOW *for a* PROFITABLE SPRING....

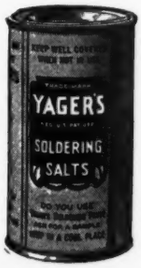
THIS winter, the most severe in fifty years, has taken a heavy toll on gutters, downspouts and roofing. Are you going to get your share of this pent-up demand?

One of the most important factors, in answer to this question, is one dependable source of supply for *everything you use*. That will enable you to concentrate on your work rather than on worrying about deliveries, price, the quality of materials, and where to buy them.

OSBORN is ready, as always, to give you just the service you need. Our success can be built only on yours and we are doing everything possible to make this the best season in many years for us both.

A DEPENDABLE SOURCE OF SUPPLY FOR 78 YEARS

THE J. M. & L. A. OSBORN Co
Manufacturers—Distributors
BUFFALO CLEVELAND—DETROIT
Metals and Metal Products



TRADE MARK
YAGERS
REG. U. S. PATENT OFFICE
SOLDERING SALTS
SAFE ~ FAST EFFICIENT
AT ALL GOOD JOBBERS IN U. S. AND CANADA
ALEX R. BENSON, INC., HUDSON, N. Y.
MANUFACTURING SINCE 1873

RYERSON
IMMEDIATE SHIPMENT FROM STOCK
More than twenty kinds of prime quality sheets are carried in stock. There is a special sheet for every purpose. Also Bars, Angles, Rivets, Bolts, Tools and Metal-Working Machinery.
Write for Journal and Stock List
JOSEPH T. RYERSON & SON INC
CHICAGO DETROIT MILWAUKEE ST. LOUIS JERSEY CITY CINCINNATI BUFFALO CLEVELAND PHILADELPHIA BOSTON
SHEETS

ALL REPAIR PARTS for FURNACES BOILERS STOVES RANGES
A.G. BRAUER SUPPLY COMPANY
316 NO. THIRD ST. + SAINT LOUIS
IN STOCK • READY FOR IMMEDIATE SHIPMENT

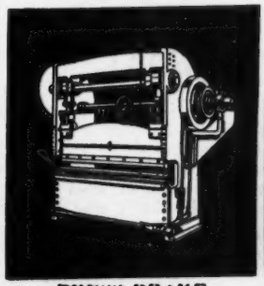
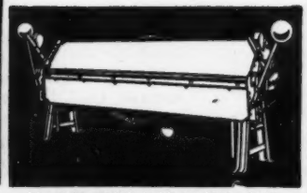
MARSHALLTOWN
THROATLESS
ROTARY SHEARS
Will take sheets of unlimited width and cut curves of small radius in any direction.
Minimum Radius 1¾"
SPECIAL PRICE
$26.00 F. O. B. CHICAGO
Other Sizes on Request
WARD MACHINERY CO.
564 W. Washington Blvd.
Chicago, Illinois

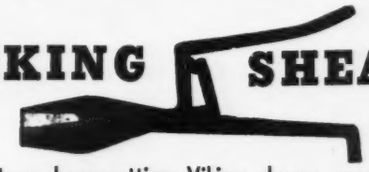
18 ga. Hand Power

KEEP OLD MAN WINTER ON THE RUN
XX TH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO

Install ÆOLUS Improved VENTILATORS

FOR industrial buildings, schools, homes, theatres, etc. Made in 14 different metals. Constant ventilation—no noise —no upkeep.
ÆOLUS DICKINSON
Industrial Division of Paul Dickinson, Inc.
3332-52 South Artesian Avenue
Chicago, Ill.


CHICAGO

PRESS BRAKE HAND BENDING BRAKE
Steel Brakes—Presses—Shears
DREIS & KRUMP MFG. CO.
7404 LOOMIS BLVD. CHICAGO

Always the tool for any Job
VIKING SHEARS

With true, keen-cutting Viking shears, your cutting problems are solved. And because they last so long and do the job so well, you cannot make a better investment.
Send today for complete information.
VIKING SHEARS
VIKING SHEAR CO., ERIE, PA.

NuDRY FURNACE CEMENT
COMPLETES YOUR FURNACE INSTALLATIONS

★ It comes to you in dry form
★ Takes less material to set a furnace
★ DOES NOT CRACK OR POWDER WHEN FURNACE IS FIRED IMMEDIATELY AFTER APPLIED
★ Will not shrink
★ Keeps joints tight at all times

PYROLITE PRODUCTS COMPANY
REFRACTORY ENGINEERS
1221-31 W. 74th St. Cleveland, O.

"WONDERFUL SERVICE"
AT THE DRAKE says MICHIGAN FINANCIAL LEADER

Mr. Benj. H. Marshall, Pres.,
The Drake Hotel,
Lake Shore Drive,
Chicago, Illinois

Dear Mr. Marshall:
I wish to assure you that my visit to Chicago was made a real enjoyable one because of the fact that I did stay at The Drake. Everything was done by your employees to make my visit with you a success and I wish to compliment your establishment for the wonderful service it gives.

(Original letter on file.)

The DRAKE HOTEL CHICAGO
RATES BEGIN AT $3

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 84

220—Corrosion-Resisting Steels Catalog

A new catalog, covering Bethadur and Bethalon corrosion-resisting steels and designated as catalog No. 127, is announced by Bethlehem Steel Company, Bethlehem, Pennsylvania. These two types of corrosion-resisting steels are suitable for many applications where corrosion resistance and strength are required. The steels are easily machined, forged, annealed, heat treated and welded. The catalog gives full information on all of the physical and metallurgical characteristics of the metals.

◆

221—"People Are Interested"

The title above is that of a new booklet issued by The American Rolling Mill Company, Middletown, Ohio. The story of Armco's national advertising is summarized. It tells how the mystery which had formerly surrounded the manufacture of iron and steel was lifted by advertising to the general public. It also explains how manufacturers and retailers have linked their merchandising activities with the Armco Collateral Advertising plan to increase their sales.

◆

222—Register Manual and Price List

Pocket Register Manual No. 25 is announced by United States Register Company, Battle Creek, Michigan. The pages of the catalog show illustrations of the various types of baseboard, floor, sidewall registers, return air faces, heating accessories, air-conditioning and directional flow registers, with each item accompanied by a tabulation of sizes, finishes, prices.

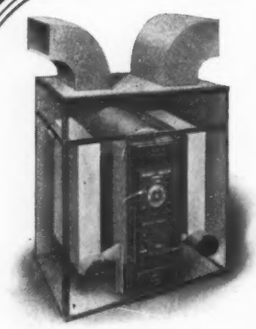
FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature." (Check numbers in which you are interested):

6	7	8	9	10	11
12	13	14	15	16	17
18	19				
214	215	216	217	218	219
220	221	222			

Name ..... Title .....
Company ....
Address .....



Higher EFFICIENCIES with Coal or Gas!

Or talking in the home owners language, "It costs less to run a MODERN HEARTH!" And that counts for a lot in this day of efficiency. You'll know the reason when you see the design. Greater heating surfaces—longer fire travel—that's the secret!

MODERN HEARTH FURNACES with Two-Fuel Feature are designed for gas and are equal to the best straight gas furnaces. Not a "convertible job!" It is the only Furnace built that can be changed from coal to gas and back again by simply moving a lever. Amazingly simple and practical!

Write for more detailed Information TODAY!

MODERN HEARTH FURNACES
THE THOMPSON MANUFACTURING COMPANY
30TH. & LARIMER STS. SINCE 1878 DENVER, COLO

CLASSIFIED ADVERTISING

4 cents for each word including heading and address. Count seven words for keyed address. Minimum $1.00 for each insertion. One inch $3.00. Cash must accompany order. Copy should reach us eight days in advance of publication date. Display rates for this page will be furnished on request.

SITUATIONS OPEN

SALES ENGINEER WANTED: Prominent manufacturer of automatic control equipment has several openings for sales engineers. Previous University training or experience in air conditioning and heating, and an acquaintanceship with architects and engineers is essential. Address Key 361, "American Artisan," 6 N. Michigan Ave., Chicago.

WANTED: Experienced furnace and air conditioning salesman for midwest territory. Give references and past record. Address Key 357, "American Artisan," 6 North Michigan Ave., Chicago.

DIVISION MANAGER WANTED: One of largest manufacturers warm air heating and air conditioning equipment desires division manager for Ohio territory. State your experience and qualifications. Address Key 362, "American Artisan," 6 N. Michigan Ave., Chicago.

WANTED—Combination man: plumber and tinner. Must have Illinois journeyman license. Must be a good workman. Address Geo. W. Read & Sons, Crystal Lake, Ill.

WANTED: First class mechanic who can lay out work from blue prints. Steady work. Must be fast. Address Key 360, "American Artisan," 6 N. Michigan Ave., Chicago.

MISCELLANEOUS

KEEP MONTHLY CONTACT WITH CUSTOMERS, PROSPECTS. Send snappy house organ everyone enjoys. Issued under your name. Your ad on front cover. Big returns, lowest cost. 500 copies. $10; 1M, $15. A proven business builder. Get sample. CRYER ADVT., 1840 E. 87th St., Cleveland, Ohio.

MAKE SOME MONEY AND HAVE SOME fun doing it. Put on a minstrel show, play, operetta. Trade and social groups are following the idea successfully with our material—plays, operettas, musical comedies, minstrels, comedy and revue songs, blackface skits, vaudeville plays and songs, musical readings and other entertainments; make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash. Dept. 26, Chicago.

Use AMERICAN ARTISAN Classified Advertising for quick results. It puts you in direct touch with the buyers and sellers in the warm air heating, sheet metal contracting and air conditioning industry.

FOR SALE

Sheet Metal Machines
New and *Really Rebuilt*

A machine for every use and every machine is ready for use. The largest stock in Chicago. Ask for list.

Complete supplies and tools.

MAPLEWOOD MACHINERY CO., Inc.
Chicago
2634 W. Fullerton Ave. Brunswick 9200
561 W. Washington Blvd. State 1405

OWING TO DEATH of owner, must dispose of old established sheet metal business in thriving town of 16,000 population in northwestern Ohio. Practically complete set of tools—fair stock. No reasonable offer refused. Address Key 363, "American Artisan," 6 N. Michigan Ave., Chicago.

USED STATIONARY VACUUM CLEANER manufactured by United Elec. Co., Canton, Ohio. Tuec No. 300. A real bargain. Walker & McQuiston, 178 Chestnut St., Medville, Pa.

MISCELLANEOUS

Patents and Trade Marks
Philip V. W. Peck
Barrister Bldg., Washington, D.C.

HOT DIP tinning of milk cans or any manufactured articles requiring tinning, galvanizing or lead coating, is profitable throughout the year. Write for our new circular showing how you can build your own equipment at small cost. Valuable information and instructions furnished free with purchase of necessary supplies. Retinning Mfg. Co., 3021 Greenview, Chicago, Illinois.

If you have anything to sell, if you are looking for a "good buy," if you are seeking a connection or if you are looking for a salesman—use the Classified Page of AMERICAN ARTISAN.

SITUATIONS WANTED

WANTED—Steady work by young man experienced in sheet metal work, warm air, steam, hot water heating and plumbing. Address Key 359, "American Artisan," 6 N. Michigan Ave., Chicago.

YOU CAN BENEFIT BY BUYING EFFICIENT
Sheet Metal Machinery at INTERSTATE

PEXTO
Appointed Distributors
Chicago Territory

Visit Our Permanent Display Pexto Products. Just received 2 carloads PEXTO Sheet Metal Machines and can make immediate shipment.

"A MACHINE FOR EVERY PURSE AND PURPOSE!"
"Draw on the Most Complete Stock in America"

SUGGESTIONS FOR TIME SAVING MACHINERY

ROLL, Slip 36" long 14 ga. **$75.00**
ELEC. DRILL ½" B. & D. **15.50**
BRAKES Chgo. St. Hand. 8'18; 8'16; 8'14; 6'18; 10'16; 10'14; 6'16; 8'12; POWER—10'10.
ROLL, Slip, 10/ 18 ga.... **225.00**
ROLLS, 30"x2"; 10'⅝"; 8'¾" 16'¾".
PRESS BRAKES, 10'10 ga.; 10'⅛".
WELDERS, arc 150, 200 & 300 Amp.
SHEARS, FOOT: 30", 36", 42", 52", 62", 90".
SHEARS, POWER: 36" 18 ga; 52" 16 ga; 60" 18 ga; 8' 16 ga; 8" 14 ga; 8' 10 ga; 10' ⅛".
WELDERS, SPOT: 7½KW Taylor, $135.00—12½ KW Federal.
PUNCHES: Niagara 36" throat $85.00; Clough 18" throat $45.00.
BEADERS: Nia. 28" thr. $85.00 14 ga. Power..... **$125.00**
FOLDERS: 20"—30"—36"—42".

Don't let your Surplus Machinery stand idle. TRADE IT IN on Interstate Guaranteed Reconditioned Equipment. We carry America's largest stock Modern Machinery at prices that will suit your bank book. Let us quote.

Write for Bargain Bulletin No. 835-A
NEW & USED PRESS BRAKES — HAND MACHINES — STAKES ROLLS — SHEARS — BRAKES — PUNCH PRESSES BUTT. ARC & SPOT WELDERS — FOLDERS **HAND & POWER**

INTERSTATE MACHINERY COMPANY
130 S. Clinton St. (FREE PARKING) **Chicago**

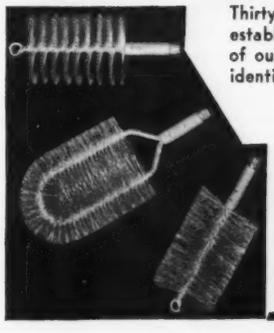
GOHI Pure Iron-Copper Alloy, the longest lasting, low-cost ferrous metal, is available in all commercial sizes and gauges.

THE NEWPORT ROLLING MILL CO.
Newport, Ky.

GENUINE OPEN HEARTH IRON
GOHI
PURE IRON - COPPER ALLOY
REG. U.S. PAT. OFF.

GOHI
SHEET METAL

SCHAEFER BRUSHES
BUY SCHAEFER-IT'S SAFER



Thirty years of uninterrupted growth has established the name "Schaefer" as a mark of outstanding value in every type of brush identified with the name.

SCHAEFER
FLUE AND FURNACE BRUSHES

are matchless for their purpose. They are fulfilled construction and painstakingly made to meet the special service for which they are designed. That is why Schaefer Brushes can be and are guaranteed to give full satisfaction. You can't get more for your money and you can't afford to accept less. Buy Schaefer—it's safer.

SCHAEFER BRUSH MFG. CO.
1007 S. Second St. **Milwaukee, Wis.**

Index to Advertisers

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in alternate issues is marked with an asterisk.

March, 1936

Acme Heating & Ventilating Co., Inc. ..... *
Aeolus Dickinson 83
Aerofin Corporation 51
Air Controls Inc., Division of The Cleveland Heater Co.... 57
Allegheny Steel Co. ..Back Cover
American Air Filter Co., Inc... 27
American Brass Co. 67
American Radiator Company... 40
American Rolling Mill Co., The .....Inside Back Cover
Auer Register Co..... 50
Automatic Humidifier Co. 58
Automatic Products Co. ..... *
Autovent Fan & Blower Co.... *

Baldor Electric Company..... 49
Barber Gas Burner Co., The... 51
Bead Chain Mfg. Co..... 75
Bellevue Stratford Hotel..... *
Benson Co., Inc., Alex R..... 83
Berger Bros. Co..... 81
Bishop & Babcock Sales Co.... *
Brauer Supply Co., A. G..... 83
Brillion Furnace Co..... *
Buffalo Forge Company..... 62

Canton Steel Ceiling Co..... 81
Capitol Furnace & Stove Repair Co. ..... *
Central Furnace & Stove Repair Co. ..... *
Century Engineering Corp..... 43
Chandler Company ..... *
Christie Cleaner Co..... 79
Clarage Fan Co..... 59
Columbus Humidifier Co., The *
Cook Electric Co..... 52

Dail Steel Products Co..... 25
Detroit Lubricator Co..... *
Drake Hotel, The..... 84
Dreis & Krump Mfg. Co..... 83

Electric Vacuum Cleaner Co., Inc. ..... *
Elgo Shutter and Manufacturing Co. 58
Excelsior Steel Furnace Co., The *

Faultless Heater Corp..... *
Fireline Stove & Furnace Lining Co. 81
Fox Furnace Co., The..... 39
Friez & Sons, Inc., Julien P..... *
Furblo Company 55

General Electric Company..... *
Grand Rapids Furnace Cleaner Co. 77

Harrington & King Perf. Co... 77
Hart & Cooley Mfg. Co..... 53
Hart Mfg. Co., The..... *
Henry Furnace & Foundry Co., The 76
Hess-Snyder Co. 79
Hess Warming & Ventilating Co. 59
"Home Comfort" Furnace & Mfg. Co. ..... *
Hotel Melbourne ..... *
Hussey & Co., C. G..... 71

Independent Register & Mfg. Co. 77
International Engineering, Inc.. 60
International Nickel Co., Inc... 7
Interstate Machinery Co..... 85

Joliet Heating Corporation.... *

Lamneck Products, Inc..... *
Lau Heating Service, Inc..... 48
Liberty Foundry Company..... 75
Lincoln Electric Co., The..... *

Maid-O'-Mist, Inc. ..... *
Maurey Manufacturing Corp... 58
Mercoid Corporation, The..... 24
Meyer & Bro. Co., F..... *
Meyer Furnace Co..... *
Minneapolis-Honeywell Regulator Co. 26
Monmouth Products Co..... *
Morency-Van Buren Division Scovill Mfg. Co..... 56
Mt. Vernon Furnace & Mfg. Co. *
Mueller Furnace Co., L. J..... 8

National Foundry & Furnace Co. ..... *
National Super Service Co..... 80
New Haven Copper Co..... 74
Newport Rolling Mill Co..... 85
Niagara Machine & Tool Works 78
Northwestern Stove Repair Co. *
Nu-Way Corp., The..... 57

Ohio Electric Mfg. Co..... 57
Osborn Co., J. M. & L. A..... 82
Owens-Illinois Glass Co..... 28

Parker-Kalon Corp. ....72 and 73
Payne Furnace & Supply Co.... 59
Peerless Electric Co. 57
Peerless Foundry Co. 6
Peoples Oil Burner Co..... 49
Perfection Stove Co..... *
Premier Division, Electric Vacuum Cleaner Co., Inc..... *
Pyrolite Products Co..... 84

Randall Graphite Products Corp. 58
Republic Steel Corp..... .....Inside Front Cover
Revere Copper & Brass, Inc.... *
Richardson and Boynton Co... 69
Round Oak Co..... 54
Ruby Chemical Co..... *
Rudy Furnace Co..... 5
Russell Electric Company..... 3
Rybolt Heater Co., The..... 77
Ryerson & Son, Inc., Joseph T.. 83

Schaefer Brush Mfg. Co..... 85
Schwitzer-Cummins Co. ..... *
Scovill Manufacturing Co..... 56
Stanley Works, Inc..... 75
Swartwout Company, The..... 71

Thompson & Co..... 79
Thompson Manufacturing Co... 84
Tork Clock Company..... 60
Trane Company, The..... 55
Twentieth Century Heating & Ventilating Co. 83

Victor Electric Products, Inc... *
Viking Shear Co..... 83

Walsh Refractories Corp..... *
Ward Machinery Company.... 83
Waterloo Register Co., The.... *
White Mfg. Co..... 59
Whitney Mfg. Co., W. A..... 81
Whitney Metal Tool Co..... 61
Wickwire Spencer Steel Co.... 79
Will-Burt Co., The..... 53
Wilson & Co., Inc..... 44
Wisconsin Humidifier Co..... 60
Wise Furnace Co., The..... *
Wood Industries, Inc., Car.... 60

XXth Century Heating & Ventilating Co. 83

York Oil Burner Co. Inc. 47

Here's a Beauty *that's No Weakling*

ARMCO Stainless Steels are more than beautiful sheets. There's not a weakling in the crowd. When it comes to corrosion resistance, tensile strength or resistance to the effects of high heat, they're as tough as they can be.

But at that point their toughness ends. In practiced hands they are ductile and easy to work. ARMCO Stainless shapes, forms, welds, solders or rivets with no trouble at all. Even though you've never worked with stainless steel, we can quickly show you the way to get the best results.

A number of grades of ARMCO Stainless are available, a right grade for the right purpose. Six different finishes ranging from hot-rolled annealed to high-lustre polish, give you ample selection to meet every possible specification.

Whenever you need a dress-up sheet or one to withstand unusually severe conditions, use ARMCO Stainless Steels. They are easy to clean and keep clean and bright, corrosion resistant and exceptionally workable. Something else: You can be sure of the same uniformity you always get in other Armco sheets, such as durable Ingot Iron and plain or copper-bearing steel sheets.

You can depend on quick delivery of ARMCO Stainless from the nearest Armco Distributor. Consult with him on difficult working problems or write direct to us. The American Rolling Mill Company, Executive Offices, 703 Curtis St., Middletown, O.

ARMCO

ARMCO STAINLESS STEELS

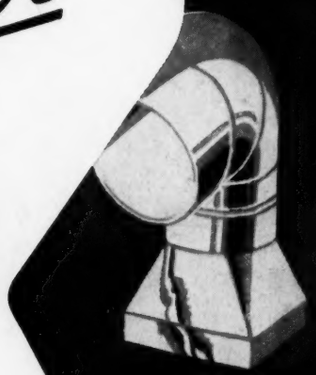
KITCHEN EQUIPMENT

PORTABLE BARS

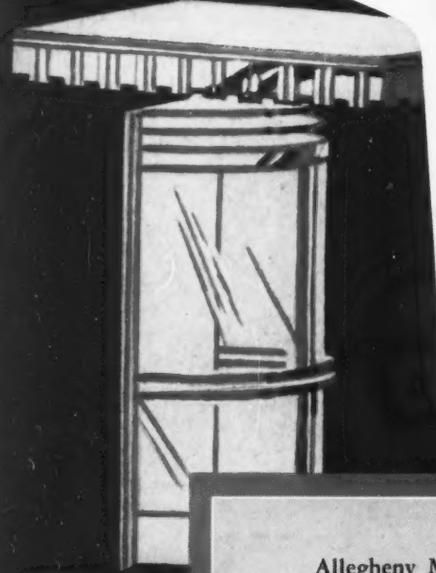
STOVE PIPE

You can make it Better with ALLEGHENY METAL

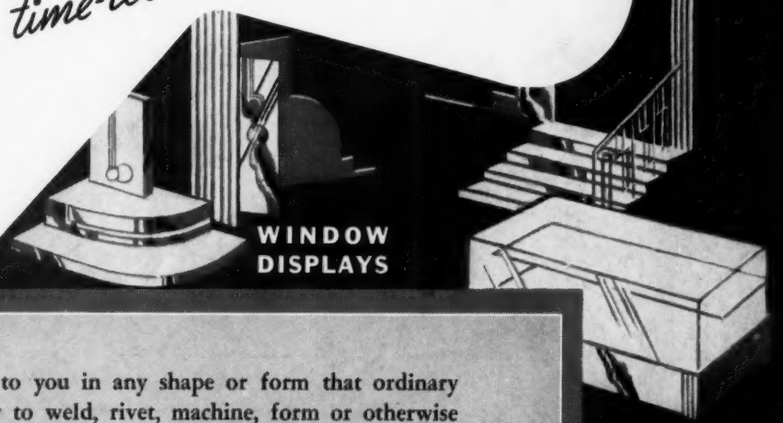
The time-tested stainless steel



VENTILATORS



ENTRANCES



WINDOW DISPLAYS

STORE EQUIPMENT

Allegheny Metal is available to you in any shape or form that ordinary metals can assume. It is easy to weld, rivet, machine, form or otherwise work; you can put it to any use where you now employ lesser metals. *And gain immeasurably thereby!*

This time-tested stainless steel doubles the strength of your product, or halves the weight with equal strength. It multiplies the beauty, life and wear-resistance a hundredfold. It requires no painting or plating; needs only soap and water to stay bright and new; remains untouched by all normal forms of corrosion. ● Allegheny Metal adds *the qualities that sell!* Specify and use it wherever possible; our assistance is always at your disposal.

ALWAYS YOUR BEST STAINLESS STEEL SPECIFICATION

Allegheny METAL CONTROLS CORROSION THE SAFE METAL

ALLEGHENY STEEL COMPANY

BRACKENRIDGE, PA.

Sales Offices and Warehouse Stocks in the Principal Cities

Warehouse Stocks are carried by JOS. T. RYERSON & SON, INC., WAREHOUSES: Union Hardware & Metal Co., Los Angeles . . . American Brass & Copper Co., San Francisco—Oakland

ALLEGHENY PRODUCTS: SHEETS FOR AUTOMOBILE BODIES, METALLIC FURNITURE, DEEP DRAWING, ALLEGHENY METAL, ALLEGHENY STAINLESS STEELS, ELECTRICAL SHEETS, STEEL CASTINGS, SEAMLESS TUBING, BOILER TUBES, PIPE

(Allegheny Metal is licensed under Chemical Foundation Patents Nos. 1,316,817 & 1,339,378)